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An Exploration of Technology Leadership in Three Maine Public School Districts

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AN EXPLORATION OF TECHNOLOGY LEADERSHIP

IN THREE MAINE PUBLIC SCHOOL DISTRICTS

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A DISSERTATION

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An Abstract of the Dissertation Presented
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Abstract

The promise of technology for positively influencing student outcomes is being hampered by a lack of understanding of who is leading technology in public schools and differing beliefs of technology use among technology leaders. The purpose of this qualitative multi-case study was to describe and understand the nature of technology leadership in three Maine public school districts. Research questions explored the roles, responsibilities, values, and beliefs of the technology leaders and examined how technology leaders mobilized stakeholders in using technology to positively influence student outcomes. Fifteen participants were interviewed from across three case sites. Data analysis was guided by the conceptual framework using a "bottom-up" inductive approach. From the results of the study, technology leadership is defined as the enactment of a shared vision for learning with technology that: incorporates the values and beliefs of the technology leaders, teachers, and staff; utilizes a leadership framework where all technology leaders can lead in an atmosphere of trust; and uses adaptive leadership strategies (Heifetz, 1994) to mobilize technology leaders, teachers, and staff in using technology for the enhancement of student learning.

DEDICATION

To my fellow technology leaders who work hard to make technology happen in their schools and districts.

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CHAPTER 1

INTRODUCTION

School districts across the nation are teaching students the technology skills they need to live and work in the 21st century (Collins & Halverson, 2018); however, there are indications that there is an unrealized promise that technology may positively influence student outcomes (Cousins, 2016; Ferster, 2014; Weston & Bain, 2010). For the purposes of this study, *technology* is considered anything related to digital computing, such as networking, hardware (computers, tablets, and/or peripherals), software, or the Internet (IT, 2013). Technology is prevalent in public schools, with billions of dollars being spent on infrastructure, Internet access, and laptop programs (Allen, 2003; Anderson & Dexter, 2005; Brockmeier, Sermon, & Hope, 2005; Macaulay, 2009). Maine public schools also invested heavily in purchasing technology for student learning, but, as Feinberg (2017) pointed out, a yet unrealized promise for technology to increase student learning remained. This unrealized promise was something I grappled with as a technology coordinator/director in two different public school districts in Maine.

Two examples highlight the frustrations I faced when trying to lead staff in integrating technology into their classrooms. The first example involves differences between the staff and student use of technology. By 2004, the school district where I worked was connected to the Internet, and teachers had the ability to access knowledge and communicate with anyone from around the world. The devices the teachers used were available at all grade levels; many classrooms had three computers for students to use. There were computer labs in all of the schools and a one-to-one laptop ratio in the seventh and eighth grades. Despite the presence of this technology, only a handful of teachers took advantage of the Internet and used it to reach out beyond the four walls of their classrooms. Thinking the problem stemmed from a lack of

training, our district offered professional development when possible. Because formal professional development time was limited, we could only offer optional after-school training. The teachers who showed up, however, were usually the ones already using the Internet in their classrooms. Repeated efforts had done little to spur more participation, a problem compounded by the fact that the principals and other non-technology leaders in the school were also limited in their knowledge of how to use the Internet to enhance instruction.

This lack of knowledge by principals, teachers, and non-technology leaders stood in stark contrast to students' use of laptops, smart phones, or tablet devices. Students interacted with each other over the Internet outside of school yet were required to "power down" those very devices inside school and use books, pencils, and paper when in class (Puttnam, 2007). Knowing that teachers were personally using the Internet outside school only compounded my frustration—why were teachers reluctant to use the Internet to interact with students and teachers from around the state, country, and world, and why were teachers reluctant to incorporate web-based technologies in order to enhance their teaching practices?

I was also frustrated with the principals, who were reluctant to encourage teacher use of the Internet even though they seemed on-board with the ideas when I presented them. I knew the principals were also personally using the Internet outside of school, so why were they reluctant to encourage its use in school for learning? My leadership was not making much of a difference in changing that practice, and the principals were not interested in pushing the issue. Moreover, except for a few, the teachers were also uninterested in adopting this practice. I asked myself who was supposed to be leading in this situation, and why were many teachers holding back?

The second example concerns a lack of decision-making by leaders regarding technology related to a federally funded mathematics program and the teacher. My district for many years

had qualified for federal funding that provided money for high-poverty and low-performing schools to improve their students' mathematics achievement (US DOE, 2006). One of the schools in my district employed three teachers using this funding. Our district had success using an Internet-based mathematics program; however, new Internet-based programs were continually being developed by vendors, often at low cost as a way of enticing teachers to use them.

One of the mathematics teachers, with the best of intentions, began using such a program for her students and paid for site access with her own money. The students loved the program and seemed to be making academic gains, so the teacher approached me to see if I could fund a school-wide license for the next school year. I agreed. The same teacher signed up for another Internet-based mathematics program the following year, paid for it with personal money, and began using this new program with her students. Seeing good results, she again asked me to purchase licenses for more students. This time, I realized I had not thoroughly vetted any of the requested mathematics programs to find out more about the mathematics programs being used before committing additional funds. I approached the building administrator to find out what process had been employed in deciding which programs to use. I found out that no discussion or decision-making process had been used at all, and the principal had assumed it was my decision, or the teacher's decision, to make. The teachers also thought the decision was mine to make.

This situation showed me that there was confusion among administrators and teachers about who was in fact leading technology integration in my district. This raised further questions. Should the principal be involved in making decisions on which software program to use in the curriculum? If the principal were involved, would he/she feel ready to be able to lead in this situation? Should I be involved as the technology coordinator/director? How important were the informal leaders (leaders who do not have positional authority) in a situation like this, and how

much of the decision-making process should be left to the informal leader or leaders? How do we reconcile the differences in beliefs on the use of software amongst the teachers, principal, and me?

The issues highlighted in these examples and the questions I asked both underscored the need for a deeper exploration of how technology leadership is structured and practiced in public schools nationally and in Maine. These issues were present in Maine public schools even after the adoption of the Maine Learning Technology Initiative (MLTI) program in 2002. MLTI was established to provide laptops to all seventh and eighth grade students and about half of the high school students in Maine (Silvernail & Gritter, 2007). MLTI required each district to create a leadership team consisting of the principal, assistant principal, teacher leader, technical lead, and librarian (MLTI, 2014a). Professional development was seen as an important part of the program, so technologically competent educators were deployed to offer workshops related to the use of MLTI devices in the curriculum (MLTI, 2014b).

Anecdotal evidence from other technology coordinators and directors from around the state led me to believe that the issues I had encountered in my district were issues in other Maine public school districts as well. There was a lack of understanding of who should lead in technology integration, there were differences in beliefs between staff members, and there was limited time for technology leadership activities in other public school districts in Maine. I was unable to find research studies based in Maine public schools to corroborate this anecdotal evidence, but my review of the literature revealed that these issues occur nationally.

Nationally, organizations such as the International Society for Technology in Education (ISTE) and the Partnership for 21st Century Skills worked to identify and define the technology skills students needed in order to excel in the areas of critical thinking, mastery of core subjects,

global awareness, and civic literacy (ISTE, 2014, P21, 2012). Additionally, digital technologies such as computers, mobile devices, and personal media players have been considered important tools for developing these 21st century skills and helping students navigate the "technology and media-suffused environment" they live in (P21, 2014, pg. 5). Progress in implementing the use of these devices for 21st century learning in the classroom had been slow to non-existent (Barseghian, 2012). Boser (2013), in analyzing the 2009 and 2011 background surveys of the National Assessment of Educational Progress, found that

> [a]cross the nation, we found that many [K-12] schools were using technology in the same way that they have always used technology; students are using drill and practice programs to hone basic skills. Students are passively watching videos and DVDs. Too many students do not have access to hands-on science projects. In short, there is little indication that technology has revolutionized our nation's school system (p. 4).

Even innovation among schools' use of technology was not translating into the higher standardized test scores that many states used to gauge student achievement (Richtel, 2011).

School leaders were "at the focus" of this "technopedagogical" shift (McLeod & Richardson, 2011, p. 217) in which the emphasis was shifting to enabling students to do what they needed to do, what they wanted to do, and what worked best for them in terms of learning with technology (Christensen, Johnson, & Horn, 2008). The context in which leadership decisions regarding technology were made had changed, and school leaders were lacking understanding as to who should be making decisions about learning with technology. Identifying the appropriate leader of the use of technology for instruction in schools was an understudied area (McLeod & Richardson, 2011). Research on technology leadership indicated that principals

should be technology leaders (Anderson & Dexter, 2005; Brockmeier et al., 2005; Creighton, 2003; Grady & Gosmire, 2007; Hew & Brush, 2006; Holland & Moore-Steward, 2000; Kozloski, 2006; Sharp, 1998). The principals themselves acknowledged that they needed to be technology leaders (Brockmeier et al., 2005; Miller, 2008). Meanwhile, technology coordinators were also viewed as technology leaders (Sugar & Holloman, 2009). Teachers often took on technology leadership within classrooms either because technology staffs were often too busy to help because of other pressing duties (Lai & Pratt, 2004) or because they were perceived by their colleagues as technology leaders. School library media specialists, who were already working with teachers on instructional matters, became experts in the new technologies being introduced into the library and worked with teachers on navigating the online world (Balas, 2001). District level leaders were also involved in working with principals on technology leadership (Adamy & Heinecke, 2005; Carr, 2010).

Having such varied leadership led to confusion as to who was leading technology. Many of the technology leaders identified above were informal leaders from classrooms, libraries, and computer labs (Flanagan & Jacobsen, 2003). As such, informal communications often occurred outside of technology meetings, which built resentment among staff members who were not included (Davidson, 2003). Moreover, many technology leaders also did not perceive themselves as ready to lead technology use in schools owing to a general lack of pedagogical knowledge about using technology in teaching and learning (Flanagan & Jacobsen, 2003). As a technology leader without a background in pedagogy, I was reluctant to lead changes to the curriculum. Even technology coordinators who did have a pedagogical background found that they were either too busy owing to maintenance and other issues to lead curricular changes or were not perceived as having that role by other leaders in the school or district (Reilly, 1999).

Teachers sometimes felt pressure from outside groups, parents, and principals to introduce new technologies into the classroom but felt vulnerable doing so without adequate professional development (Watts, 2009; Williams, 2007). Principals often felt they did not have enough professional development or expertise to lead the use of technology effectively (Dikkers, Hughes, & McLeod, 2005). Technology coordinators attempted to lead but often were not supported by the principals or given the authority to carry out decisions (Wang, 2010). Finally, many of the technology leaders were often occupied by other day-to-day duties and so could not attend to technology integration efforts (Berrett, Murphy, & Sullivan, 2012; Brockmeier et al., 2005; Carey, 2010; Carr, 2010; Langran, 2006; Wang, 2010).

The school's vision of technology use was also influenced by the school leader's vision for the use of technology (Dexter, 2011); however, many leaders felt they did not have a clear enough vision of technology use effectively to lead technology integration in their schools (Persaud, 2006). Additionally, Windschitl and Sahl (2002) observed that there can be no individual or institutional vision of technology use that exists separately from beliefs about the students' use of technology, beliefs about what constitutes good learning via technology, or beliefs about how the teacher's role fits in the school's overall vision of technology use. When formal leaders had differing beliefs on the need for technology and refused or were reluctant to lead such efforts, the end result was frustrated teachers and technology staff (Wang, 2010). These issues, nationally and in Maine, pointed to a problem of practice in need of further study.

Problem Statement

The promise of technology for making inroads into teaching and learning to influence student outcomes positively was being hampered by a lack of understanding as to who is leading

technology in public schools and by differences in beliefs regarding the value of technology for teaching and learning among different technology leaders.

The Nature of Technology Leadership

Two areas constitute the nature of technology leadership for this study: the definition of technology leadership itself and the expectations that are had of technology leaders. *Technology leadership* was defined as the budgeting, implementation, and maintenance of computers and other technologies for the classroom (Lesisko, 2005; Moursund, 1992). Anderson and Dexter (2005) define it as "the organizational decisions, policies, or actions that facilitate effective utilization of information technology throughout the school" (p. 80). The *expectations* of technology leaders, in contrast, are that those leaders will be involved in "discovering, evaluating, installing, and operating new technologies of all kinds, while keeping teaching and student learning as the guide and driving force behind it all" (Papa, 2010, p. 5). *Technology integration* is the extent to which the use of technology fits into the overall unit of instruction as an instructional tool to facilitate the development of knowledge and skills acquisition, communication, productivity, and research (Baylor & Ritchie, 2002; Granston, 2004).

Researchers also sought to determine who bore the responsibility for enacting technology leadership and guiding the implementation of technology for learning. Some researchers identified technology coordinators, principals, and teachers as technology leaders. Lesisko (2005) was one of the first researchers to state that technology coordinators had an important role in supporting principals who were leading in technology integration. Subsequent researchers looked at various models of *shared leadership* to see how those models applied to technology leadership. Sugar and Holloman (2009) examined the role of the technology coordinator as co-leader with school principals. The idea of "shared leadership" between the school principal and

technology coordinator was advanced as a way of explaining what was actually occurring in schools regarding technology leadership. Pearce and Conger (2002) defined *shared leadership* as a "dynamic, interactive process among individuals in groups for which the objective is to lead one another to the achievement of group or organizational goals or both" (p. 1). Research by Ertmer (2002) supported the idea that principals saw technology leadership as a shared endeavor between themselves and technology coordinators.

Not all technology leaders were ready to lead or were too busy to lead. In two studies (Carey, 2010; Dikkers et al., 2005), school principals or other school administrators expressed the belief that they did not have enough professional development with technology to lead staff in using technology; they were reluctant to take on the role of technology leader. Two other studies (Devolder, Vanderlinde, van Braak, & Tondeur, 2010; Lai & Pratt, 2004) showed that the technology staff could be occupied doing technical support and therefore lacked the time to perform technology leadership functions.

Teachers were also identified as leaders within the shared technology leadership construct. Being close to students and working with other teachers gave teacher leaders great opportunities for "stimulating invention" in the classroom (Donaldson, 2007, p. 136), and this stimulation was applied to computers in the classroom by teacher leaders (Becker & Riel, 2000).

A few studies used the framework of *distributed leadership* as a way of determining who might be potential technology leaders (Dexter, 2007, 2011; Levin, 2012; Seong & Ho, 2012). As defined by Spillane (2006), *distributed leadership* is leadership that constitutes a collective action among leaders, followers, and the situation at hand. Spillane wrote that the phenomenon of leadership in ways that come "closer to approximating leadership on the ground" than many of the other theories for school leadership (p. 26). This product of the interaction among leaders,

followers, and the situation is called “leadership practice” (Spillane, 2005, p. 144) and has three elements: leadership practice involving multiple leaders (both formal and informal); leadership practice where followers are a part of the practice; and leadership practice comprising critical interactions among leaders and followers.

Dexter (2007, 2011) analyzed technology leadership as a distributed process. In a study and a follow up, Dexter found that technology leadership was distributed across a team of people who together provided technology expertise and decision-making authority for their schools. Interactions between the central office and school-level leaders were examined, and differences among the interactions were found depending on the levels at which the interactions occurred. The interactions between central office staff could be one-way interactions or collaborative, or they could be about managerial items or best practices. The types of interactions depended on the makeup of the leadership team at each school.

Researchers identified teachers as partaking in distributed leadership through informal means—e.g., talking with one another about technology use in the classroom—and as followers who interacted with the technology leaders. As early as the 1990s, Moursund (1992) talked about how principals informally identified teachers to whom they could turn for help in answering technology questions. Heller and Firestone (1995) found that teachers performed a variety of leadership functions, such as providing an overall vision for technology use in their schools or obtaining resources, and therefore provided evidence that teachers could be informal leaders within their schools. Flanagan and Jacobsen (2003) found that informal technology leaders emerged from the teaching staff as well as from libraries and computer labs. York-Barr and Duke (2004) suggested that distributed leadership was one of the four conceptions of leadership along with participative leadership, leadership as an organizational quality, and parallel leadership (p.

261). Perhaps the most complete explanation of informal leadership came from Leithwood, Mascall, Strauss, and Sacks (2007), who said that informal leaders were accepted as leaders both because of the expertise they show and also because they were perceived as leaders within their organization. Such informal leaders were actively involved in creating high expectations for the organization, in motivating others, and in redesigning the organization (Leithwood et al., 2007). In summary, as Dexter (2011) pointed out, technology leadership varied substantially from district to district, and even from school to school within the same district.

The Values and Beliefs of Technology Leaders

The importance of *vision* in how technology was used in the classroom to aid student learning was identified in many studies (Carr, 2010; Persaud, 2006; Schrum, Galizio, & Ledesma, 2011; Seong & Ho, 2012; Wang, 2010). Carr (2010) and Wang (2010) examined the principal's vision of technology integration and found differences between it and the collective vision of the school. Persaud (2006) found that principals felt that they did not have a clear enough vision of technology use in the classroom effectively to lead technology integration in their schools. Other researchers found that the attitudes of the principals toward use of technology in the classroom was also a factor (Berrett et al., 2012; McGrail, 2005; Seong & Ho, 2012). Dexter (2011) laid out a succinct line of reasoning for the importance of having a vision of technology use: the vision influenced which colleagues at the school became incorporated into the teacher's learning environment, i.e., the positions that were created and the roles that were played in supporting and leading the use of technology. These individuals then had an impact on the "depth of knowledge" (p. 184) that teachers developed in integrating technology and also had impact via the support they gave teachers. The vision of technology use also influenced not only the alignment of Internet use and computer programs with the curriculum but also the make-up

of the technology committee. Thus, the vision of technology use encouraged what leaders and teachers did in the system of leadership practice.

There was also a movement in the early 2000s to view technology as a component of an overall vision for learning rather than to provide a strict vision of technology use. Mishra and Koehler (2006) suggested viewing the knowledge about best practices for incorporating technology in the classroom as Technological Pedagogical Content Knowledge (TPCK). The goal was to focus teacher efforts on changing student learning outcomes "by allowing students to learn in contexts that honor the rich connections between technology, the subject matter (content), and the means of teaching it (the pedagogy)" (p. 1047). Further research, however, was yet needed to see if success in student outcomes as a result of the TPCK was a result of the framework itself or a result of a teacher's favorable predisposition to using technology in the classroom (Krauskopf & Forssell, 2013).

Sometimes having both a great vision for technology use and access to all of the technology needed to enact that vision was not enough to encourage some teachers to change (Windschitl & Sahl, 2002). Pajares (1992) noted that "[l]ittle will have been accomplished if research into educational beliefs fails to provide insights into the relationship between beliefs, on the one hand, and teacher practices, teacher knowledge, and student outcomes on the other" (p. 327). The belief underlying the vision of technology leaders required further analysis. This dissertation used the framework of adaptive leadership proposed by Heifetz (1994) owing to its potential to add to the research base on technology beliefs. Heifetz's framework of adaptive leadership examines how and why people do or do not change; moreover, it views leadership in terms of *adaptive work*, which leaders need to do when changes in an organization conflict with the values, beliefs, or behaviors of people in the organization and, thus, encounter resistance.

Technical work, on the other hand, is work that leaders can address with a "fix," such as bringing in an expert or providing further education to an employee (Heifetz, 1994, p. 73). Perhaps technology leaders had been applying technical fixes to technology leadership issues all along, in which case all of the elements that school districts had in place (technology coordinator, technology personnel, technology committees, professional development) were merely technical fixes to an adaptive problem. Adaptive challenges, according to Heifetz, are not clear-cut problems with easy technical fixes; in order to solve an adaptive challenge, learning by leaders and followers is required to define the problem and implement the solution. Analyzing technology leadership as an adaptive challenge may lead to strategies that will help to guide technology leadership decision-making and enhance the effectiveness of technology leadership efforts.

In summary, the promise of technology to help schools make inroads into teaching and learning and make a positive influence on student outcomes was being hampered by a lack of understanding as to who was leading technology in schools I had worked in; moreover, this reflected the condition in Maine public schools and in schools nationally. Differences in beliefs about the value of technology for teaching and learning among different technology leaders were also discussed in these schools. This study sought to address both issues.

Purpose of the Study

The purpose of this qualitative multi-case study was to describe and understand the nature of technology leadership in three Maine public school districts and explore the values and beliefs of technology leaders in those schools.

Research Questions

1. What are the roles and responsibilities of technology leaders in three Maine public school districts?
    a. How are technology leadership responsibilities shared and distributed amongst the technology leaders and/or other teachers and staff?
    b. What is the nature of communication and interaction between technology leaders and other teachers and staff?
2. What are the values and beliefs of the technology leaders concerning the use of technology?
    a. What are the technology leaders' beliefs about the use of technology in instructional practices?
    b. What are the technology leaders' beliefs about the student's use of technology for enhancing learning?
3. How do technology leaders mobilize stakeholders in using technology to positively influence student outcomes?

Significance of the Study

I chose to study technology leadership because the issues I saw as a technology coordinator were issues facing public schools in Maine and across the nation, yet technology leadership was an area of study that lacked a substantial body of research (McLeod & Richardson, 2011).The goal for this study was to build on prior research on technology leadership and provide data that will aid in understanding how school districts can best employ both formal and informal technology leadership personnel in order to guide students in using technology for the enhancement of learning.

My desire to conduct research on technology leadership came from my own experiences as a technology leader in public schools in Maine, and in this introductory chapter I have summarized my review of the literature to show how the issues I have seen in my own school district are issues that are found in my home state and nationally in other public schools. My brief overview of the literature, which will be expanded upon in the next chapter, has highlighted how technology leadership has been studied (as an exercise in distributed leadership) and, more importantly, how it has not been studied (as an adaptive challenge). This review led directly to my problem statement of a lack of understanding of who was leading technology in public schools and also a lack of knowledge about the beliefs about technology use in education among technology leaders. It therefore informed my choice of a qualitative multi-case study guided by three research questions. The significance of the study lay in informing not only current technology leaders in public schools in how to best approach technology leadership decision-making; it also sought to lay the groundwork for future research related to the values and beliefs of technology leaders.

CHAPTER 2

LITERATURE REVIEW

This chapter reviews the literature related to this qualitative multi-case study of technology leadership in three Maine public schools. McLeod and Richardson (2011) identified the need for increased foundational research regarding technology leadership. In a meta-study of journal articles spanning 1997–2009, McLeod and Richardson mentioned that literature base on school technology leadership was so limited that it constituted a "slim empirical core" (p. 236) on which to make recommendations for education technology leadership practices. Other researchers had also called for more research on various aspects of technology leadership (e.g., Dexter, 2011; Ertmer, 2005; Waxman, Boriack, Lee, & MacNeil, 2013).

What follows is an examination of the literature on technology leadership. A trip through time illustrates the lack of understanding of who was leading technology and differences in beliefs about teaching and learning. This journey was organized into four sections: the emergence of technology experts in public schools, the study of technology leadership after the year 2000, research on leadership frameworks for technology leadership, and research on visions and beliefs and technology leadership. The conceptual framework guiding this study is introduced after the literature review.

The Emergence of Technology Experts in Public Schools

Technology, defined in Chapter 1 as anything related to digital computing, had become ubiquitous in most public school classrooms since the mid-1970s. What had also become ubiquitous was a multitude of school personnel who helped lead and manage this technology. The following overview examined how the computer coordinator and technology coordinator

positions emerged as technology experts in public schools and began to be perceived as technology leaders.

Computer/Building Coordinators

Technology in the form of computers was first introduced into classrooms in quite small numbers in 1975 (Murdock, 2011). Technology adoption was slow due to the high cost of the devices, and in 1983 the majority of public schools in the United States had fewer than five computers. Of those schools that did have computers, fewer than ten percent had fifteen or more (Becker, 1985). With an average ratio of 125 students for every computer, exposure for students was limited (Moursund, 1992). During the 1980s, however, the number of instructional computers in public schools increased by an average of fifteen percent a year (Anderson & Ronnkvist, 1999). By the 1990s, computers were common in classrooms, with ratios of twenty and then fifteen students for every computer becoming the norm (Moursund, 1992). Support was of the self-help variety and performed by the teacher using the computer or, in some cases, another teacher in the school who was also proficient with computers (Moursund, 1992).

Eventually, the need to support teachers in the use of computers led to the creation of a new position in schools, that of computer coordinator. Evans-Andris (1995) and Marcovitz (1998) were two early researchers who examined the role of the computer coordinator position. Evans-Andris examined how the computer coordinator integrated into the school personnel structure and found that being a part-time employee and having inaccurate or incomplete job descriptions made for ambiguous and inconsistent job performances. The social dynamics of integrating a new person into the school setting also caused the coordinators to be socially isolated and rejected from the teachers. Marcovitz shadowed a computer coordinator and found that the job was mostly nuts-and-bolts type of work—i.e., fixing computers and helping staff—

but Marcovitz believed there was potential for the computer coordinator to work with teachers in using computers in the curriculum and creating policy for the school or district. These two examples of research done in that era show that the position of computer coordinator was not always welcomed with open arms but did have the potential to guide the use of computers in the classroom.

Technology Coordinators

The use of computers and other technologies in schools continued to expand. Networked computers and the use of servers for storing digital documents for administrative, classroom, and library use were becoming common in schools in the mid-to-late-1990s (Davidson & Olson, 2003). School districts were also adapting to the presence of telecommunication, power, and equipment vendors that were "now linked to the schools through their growing dependence on digital computing for administration and learning" (Davidson & Olson, 2003, p. 268). By 1998, ninety percent of public schools had access to the Internet, and twenty-six percent of the computers in those schools were able to access the Internet (Anderson & Ronnkvist, 1999). By the fall of 2003, nearly 100 percent of public schools in the United States had Internet access, with 93 percent of the instructional rooms in those schools connected (Parsad & Jones, 2005).

This new dependence on technology brought forth a need for individuals who could "translate between the technical systems and the social organization" (Davidson & Olson, 2003, p. 268) while also working at the district level. These individuals came to be known as *technology coordinators* (Moursand, 1992). Thus, in the mid-to-late-1990s, a technology coordinator joined many school support systems and helped to guide the use of computers and other technology devices, such as interactive whiteboards, televisions, digital projectors, documents cameras, digital cameras, digital video cameras, scanners, printers, copiers, DVD

players, videocassette players, and cable-to-digital converter boxes. This is where I joined the story, and as the 20th century came to a close, school leaders began grappling with this influx of new technology that was impacting teaching practices within schools (Brockmeier et al., 2005; Sugar & Holloman, 2009). Researchers then began focusing on how the leadership of the computer coordinator and technology coordinator was being incorporated into school districts. There was also research focused on identifying other potential technology leaders in school districts. The next section examines some of this research.

Research on Technology Leadership

At the dawn of the 21st century, researchers deepened their examinations of the impact that technology was having in schools all over the world. As mentioned in the previous section, researchers began studying the assimilation of computer coordinators and technology coordinators into schools. Table 1.1 (see next page) summarized the research cited in this paper for the 2000–2010 time period. Table 1.1 indicates a pattern in the nature of the research over time. Studies early in the decade focused on technology use in the classroom, which became known as *technology integration*, or the extent to which technology use facilitated teaching and learning (Baylor & Ritchie, 2002; Ertmer, 1999). Other research throughout the decade examined the role of principals, technology coordinators, and teachers in the leadership of technology use. Toward the end of the decade, research then shifted into studying the leadership attributes needed for technology leadership, the pedagogy of technology use, and professional development for technology. There were also studies on the effect of school culture and climate on technology use and the beliefs about technology integration and support. The following paragraphs examined these studies related to the role of the principal, technology coordinator, and other school personnel as technology leaders.

Table 2.1

Summary of Studies on Technology and Technology Leadership from 2001-2010 cited in this literature review—sorted by year

		Participants Included in Studies*		
	Year(s)	Principals	Technology Coordinator	Teachers
Technology Use in Classrooms	2001	0	0	1
Technology Integration	2001, 2004, 2005	3	2	3
Roles of Technology Leaders	2001, 2004, 2005, 2006, 2008, 2008(2), 2009(2), 2010(2)	4	7	2
Influences on Technology Use	2002	0	0	1
Computer Coordinator as Change Agent	2002	0	1	0
Building Leadership Capacity	2003, 2006, 2010	3	1	1
Teacher and School Characteristics for Technology Use	2004, 2008	0	0	2
Leadership Preparations	2005	1	0	0
School Culture Effect on Technology	2005	0	0	1
Leadership Attributes	2005, 2006, 2008, 2009, 2010	4	0	2
Leadership Interactions	2006	1	1	0
Pedagogy and Effective Use of Technology in the Classroom	2007	1	1	1
Professional Development	2007	4	1	0
Beliefs about Technology Integration				
Support	2007	1	0	1
School Climate and Technology				
Integration	2009	1	0	1
Totals *n=34*		23	14	16

**More than one participant may have been in each study*

Principals as Technology Leaders

After 2000, researchers began to find that the school principal was an important technology leader (Anderson & Dexter, 2005; Brockmeier et al., 2005; Creighton, 2003; Grady & Gosmire, 2007; Hew & Brush, 2006; Holland & Moore-Steward, 2000; Kozloski, 2006; Sharp, 1998). Principals themselves acknowledged the need to be technology leaders (Brockmeier et al., 2005; Miller, 2008) and considered that the effective implementation of

technology in their schools was an important part of their job (Project Tomorrow, 2010). However, principals also felt they lacked the professional development to lead technology effectively and needed additional training (Brockmeier, et al., 2005; Davidson & Olson, 2003; Miller, 2008). Flanagan and Jacobsen (2003) concluded this was because the traditional roles, responsibilities, and preparations for their positions did not prepare principals to be technology leaders. Principals also said they were not always comfortable with technology (Gibson, 2001; Ritchie, 1996) or the new networked infrastructure (Davidson & Olson, 2003); thus, they felt that they had been left to resort to on-the-job training in order to acquire necessary technology skills (Brockmeier et al., 2005).

In order to address these issues raised by the principals, the Technology Standards for School Administrators (TSSA) collaborative (2001) and the International Society for Technology in Education (ISTE) created a set of standards for school administrators in order to define "the specifics of what administrators need to know and be able to do in order to discharge their responsibility as leaders in the effective use of technology in our schools" TSSA, 2001, p. 1). The TSSA Collaborative published the first set of standards in early 2001, and the ISTE published their standards, the National Educational Technology Standards for Administrators (NETS-A), in 2002 (NETS-A, 2002). Several researchers have used the NETS-A as a framework for technology leadership of school principals (Carroll, 2010; Kozloski, 2006; Richardson & McLeod, 2011; Rivard, 2010). The conclusion from this research was that principals benefited from professional development geared toward leading technology in schools, and when principals did receive professional development or took online classes, the perceived level of importance of the NETS-A standards rose (Billheimer, 2007; Ertmer, 2002). At the time of those studies, many principals had not been provided opportunities for professional development

(Davidson & Olson, 2003; Kozloski, 2006; Rivard, 2010), as professional development in technology leadership was not seen as a priority (Miller, 2008).

Technology Coordinators as Technology Leaders

By the mid-1990s, researchers and others in public education were also acknowledging the technology coordinator as one of the key instructional technology leaders in public schools (Beath, 1991; Evans-Andris, 1995; Moursund, 1992). The qualities and the abilities researchers identified as important for technology coordinators—which included installing software, repairing equipment, and ordering technology items—were expanded to include developing the curriculum, providing training, being a visionary, being collaborative, offering direction for technology planning and implementation, and providing help to teachers and students on the use of technology (Marcovitz, 1998; Moursund, 1992; Sugar & Holloman, 2009). Thus, the technology coordinator now had additional responsibilities and was seen as being a "change agent" in helping schools adapt to the use of technology in the classroom (Moursund, 1992, p. 18).

Other Technology Leaders

Other individuals in the school were also taking on the mantle of technology leader. Necessity often forced teachers to assume the responsibility of integrating technology into their curriculum, at times using student input in the process (Benedetto, 2006; Ertmer, 2002). Sometimes considered the "core" of the school (Mackenzie, Cook, & Morrell, 2004, p. 29), these teachers took on the leadership of technology use in their classrooms when other technology leaders were either not in the building or too busy dealing with other issues (Lai & Pratt, 2004). Teacher leadership in curricular matters had been evident prior to the introduction of technology into the classroom—i.e., teachers helped to choose textbooks and instructional materials (Barth,

2001). Teacher leaders also worked to keep the focus of learning on student needs, capabilities, and outcomes and looked for opportunities to innovate (Ackerman & Mackenzie, 2007). The National Council for the Accreditation of Teacher Education added standards related to the need for teachers to integrate technology into the curriculum (NCATE, 2008) in the sections of its standards statement on educational technology facilitation and leadership.

Library media specialists also caught on to the potential of technology to raise excitement about reading among students who were used to using technology outside of school to read (Marcoux, 2012). Library media specialists had historically been experts in the various new media that were being invented, such as photographs and vinyl records, so that by 1920 books were only one part of the regular equipment in a library (Certain, 1920). As the digital age dawned, computers became fixtures in school libraries (AECT, 2001), with the library media specialists becoming the information specialist for schools using computers to access electronic records, online databases, and search engines (Balas, 2001; Sun, Chen, Tseng, & Tsai, 2011). However, in some schools the library media specialists also became the experts in helping to support the use of computers not only in the library but in the classroom as well. Being early adopters of technology entailed that the library media specialist could help with computer problems; however, providing that help was often an overwhelming experience, and library duties suffered as a result (Cameron, 1999).

Standards for information literacy were also established, and library media specialists were encouraged to partner with teachers in teaching students these new skills, with some theorists suggesting that the library media specialists take an active role in helping to restructure the teaching and learning environment to take advantage of the digital technologies now available (Rader, 1997). Everhart, Johnston, and Mardis (2011) found that library media

specialists felt they were successful in leading technology integration efforts with students in the library; they were, however, less successful in leading technology integration with teachers. Library media specialists also perceived that they had a lower level of involvement with district level technology leadership activities. Dexter (2011) found that media specialists were identifying web sites for teacher use, while Langran (2006) found media specialists helping to integrate technology into the curriculum, teach online research strategies, acquire hardware, and manage technology resources. Hughes-Hassell, Brasfield, and Dupree (2012) found that media specialists helping teachers use technology authentically to achieve the school's instructional goals.

At the district level, leaders were often responsible for defining the building principal's responsibilities regarding technology leadership but often had different visions of technology integration than the principals had (Adamy & Heinecke, 2005; Carroll, 2010). Lacking technology skills themselves, district-level leaders relied on directors of technology or technology coordinators for expertise (Carroll, 2010). Above the district-level leaders, school boards were an additional level of leadership that was involved in technology leadership, mainly related to the approval of a technology plan and budget. Additionally, the technology plan itself was often defined by a state board of education (Albanese, 2002; Lai & Pratt, 2004).

Altogether, the literature showed that a great number of people were involved in leading technology in schools. Table 1.2 (see next page) was illustrative in showing who was involved in leading technology in public schools (Gray, Thomas, & Lewis, 2010).

In summary, the year 2000 marked the beginning of a time when much work was being done in determining the makeup of technology leaders in school districts and examining the

readiness or willingness to lead technology use. Many different individuals beyond the principal, technology coordinator, and computer coordinator were identified as possible technology leaders

Table 2.2
Percentage distribution of public schools reporting the extent to which people in various roles help school staff integrate technology into instruction

Role	%
District-level Technology Staff	58%
School-level Technology Staff	63%
School-level Administrators	49%
Teachers	67%
Library Media Specialists	49%
Vendors	12%
Students	17%
Parents & Non-staff volunteers	3%

Adapted from Educational technology in U.S. public schools: Fall 2008 (NCES No. 2010-034), L. Gray, N. Thomas, & L. Lewis, 2010, Washington, DC: U.S. Department of Education, National Center for Education Statistics

within a school, and leadership frameworks for studying such a diverse group of leaders were sought by researchers. Two of the most promising frameworks used by researchers are examined in the next section.

Technology Leadership Frameworks

Two frameworks that gained traction in studying technology leadership were shared leadership and distributed leadership. These leadership frameworks were well suited to examining leadership situations with multiple leaders. The following sections reviewed the

literature on shared and distributed leadership and discussed how these frameworks were used to examine technology leadership.

Shared Leadership

Shared leadership, according to Pearce and Conger (2002), is a "dynamic, interactive process among individuals in groups for which the objective is to lead one another to the achievement of group or organizational goals or both" (p. 1). Even though much of the literature on technology leadership had focused on the principal (Ho, 2006), researchers also studied technology leadership by superintendents (Miller, 2008), by principals and technology coordinators (Baylor & Ritchie, 2002), by technology coordinators (Sugar & Holloman, 2009), and by school leaders (Benedetto, 2006) and concluded that integration of technology into the classroom would be facilitated by sharing leadership of the technology integration process.

Teachers as shared leaders were also examined. When technology began filtering into the classroom, some teachers saw the potential of technology for instruction and began innovating with technology (Anderson & Dexter, 2000; Riel & Becker, 2008). Eventually, networks of teachers sharing what they knew grew around the country and world (Riel & Becker, 2008). Being busy with other responsibilities, the technology leaders mentioned in the previous paragraph depended on the innovative teachers to lead other teachers (Hughes & Zachariah, 2001). Typically, this teacher leadership within a school was informal, and these teacher leaders were often frustrated that they were relied on to lead but were often not released from any regular classroom responsibilities in order to do so (Sheppard, Seifert, & Wakeham, 2014).

In Maine, the idea of "shared leadership teams" has also been tried since the inception of MLTI, with shared teams comprising students, teachers, administrators, school committee members, parents, and community members (Muir, 2014). The motivating idea behind the shared

leadership teams is that “no one of us is as smart as all of us together” (p. 1) and that a stronger team effort arises through the combination of unique individuals with diverse perspectives.

Distributed Leadership

Distributed leadership (Spillane, Halverson, & Diamond, 2001) is another framework of leadership that involves a collective action involving leaders, followers, and the situation at hand. Spillane (2006) wrote that looking at the interactions between leaders, followers, and situations helps us to think about the phenomenon of leadership in ways that “come closer to approximating leadership on the ground” than many other theories of school leadership (p. 26). Spillane (2005) referred to the product of the interaction involving leaders, followers, and the situation as “leadership practice” (p. 144) and consisted of the elements of leadership practice that involved multiple leaders and leadership practice that incorporated followers as part of the practice; moreover, Spillane said, interactions among leaders and followers were critical in leadership practice.

Distributed leadership involving multiple leaders. Dexter (2007) studied technology leadership in four middle schools with laptop programs and concluded that technology leadership was distributed across a team of people who together provided technology expertise and decision-making authority for the schools. The technology committee was a key component of technology leadership, with the committees consisting of principals’ technology coordinators, teachers, and others. Additionally, certain teachers served as representatives between the teaching staff and technology leadership team, communicating between the classroom teachers and the technology leadership team through informal interactions or as part of regularly scheduled meetings. Seong and Ho (2012) found technology distributed among principals, vice-principals, department heads, and teachers. Levin (2012) found that seven out the eight research

sites explicitly talked about distributed leadership, and every site in the study saw leadership in terms of building a team, working as a team, and being sure all leaders were on board with the vision, mission, goals of the school and district.

Informal technology leaders were also examined in these studies. Dexter (2011), in a follow-up study to her 2007 study, found that teachers often talked with other teachers informally to get ideas for technology use, often while walking in the hallway during breaks or before and after school. This informal exchange of information could have a moderate effect on teacher integration efforts according to Frank, Zhao, and Borman (2004). Likewise, Levin (2012) also found informal peer-to-peer collaboration and sharing among staff as evidence of further distribution of technology leadership within a cooperative culture of sharing that operated in the study sites where leaders were those who had the expertise to help. Peck, Mullen, Lashley, and Eldridge (2011) found that the site in their study had created "an ongoing yet informal technology support network" that helped to "make technology work" (p. 47).

Distributed leadership and followers incorporated into leadership practice. On the second element of distributed leadership practice, about followers being incorporated into the leadership practice, Dexter (2007) gave a succinct explanation of the interplay between the leaders and followers concerning technology implementation. Because leadership practice matters and teachers' actions determine what aspects of an innovation are or are not implemented in a classroom, it follows that teachers' understanding of who the technology leaders are and so from whom they look to get and give input about technology uses for teaching and learning also matters. Teachers most readily identify individuals in technology-specific roles as technology leaders and base their opinions of the team's coordinated effort and interest in teachers' opinions off of their direct, personal experiences with these individuals. In these distributed leadership

situations teachers' stance might be described as "show me the leadership" (p. 20). Thus, implementation efforts relied not only on the leadership being exhibited but also on the opinions of the teachers about the leaders. Dexter seemed to imply that without followers who believe in the leaders, no leading can happen. Evidence of followers not believing in leaders was also seen in Watts (2009), a study in which teachers felt pressure from outside groups, parents, and principals to introduce new technologies into the classroom but felt vulnerable when the administrators lacked technology knowledge and skills due to the perceived lack of support teachers felt they would get.

Distributed leadership and interactions among leaders and followers. Concerning the third element, that interactions among leaders and followers are critical in leadership practice, Dexter (2007) found differences among the interactions in the three middle schools in the study depending on the levels at which the interactions were taking place. The interactions between central office staff (such as superintendents and technology directors) could be one-way interactions (superintendent to director) or collaborative. Central office staff interactions with school-level technology leaders could concern managerial items, such as what is working or not working with technology, or about best practices concerning the use of technology. Interactions among district-level technology staff might be concerned with enhancing student learning using technology. What was also of interest was that among the three study sites there was no standard technology leadership structure; even the job titles were different among the three sites. For example, at one study site there was a "technology director," but at another site that position was known as the "director of information systems" (p. 10).

Together, the three elements of distributed leadership provided researchers with a more complete account of technology leadership than shared leadership did. Technology leadership

could have multiple leaders, definitely had followers (the teachers using the technology in the classroom), and could have multiple levels of interaction among leaders and leaders and followers. Further research was suggested. Recommendations for follow-up research included examining the "various membership configurations of technology leadership teams and the optimum authority and expertise levels within them" (Dexter, 2011, p. 169) and studying the distribution of technology leadership in different contexts and with different leaders (Seong & Ho, 2012). This dissertation sought to add to the research base using these recommendations as a guide in examining technology leadership in Maine public school districts using the framework of distributed leadership.

Visions and Beliefs and Technology Leadership

The final conceptual piece for this study concerned how both visions and the associated beliefs about technology use impacted the leadership of technology in public schools. The next few sections review the literature on visions of technology use, how they differ among technology leaders, and how the beliefs underlying the visions have been studied. This sets the context for this study of technology leadership as an adaptive challenge.

The Role of Vision in Technology Use

Dexter (2011) believed that the framework of distributed leadership took into account the context of the situation, which in the case of technology meant the infrastructure behind the technology. Therefore, Dexter suggested that technology infrastructure could now be included in a conceptual model of technology leadership that would allow for "an examination of the ways in which programmatic goals for technology contribute to the definition and construction of technology leadership practices" (p. 170). However, any examination of programmatic goals would need to take into account the vision of technology use that underpinned the development

of a program for technology use. As an example, Dexter related how "instruction-oriented visions" (p. 184) for the school's laptop programs influenced technology leadership practices by influencing staffing and impacts on teaching staff; these decisions were programmatic decisions that influenced the shape of the laptop programs. Dexter therefore suggested that school leaders should have a vision of technology use and be able to express it coherently. Lai and Pratt (2004) found that the principals themselves believed they should be providing a vision of technology use as well.

Differing Visions of Technology Use

Researchers found that not all technology leaders shared the same vision. Carr (2011) and Wang (2010) found that principals could have a vision of technology integration that was different than the collective vision of the school they were in; this lack of a common shared vision could make technology integration efforts challenging to continue (Carr, 2011). Additionally, principals themselves felt they did not have a clear enough vision of technology use in the classroom effectively to lead technology integration in their schools (Persaud, 2006). However, the attitudes of the principals related to use of technology in the classroom did matter (Berrett et al., 2012; McGrail, 2005; Seong & Ho, 2012). Dooley (1999) found that it was the administrators who needed to share the vision of technology use and help the teachers change beliefs on technology usage; ultimately, it was the teachers who implemented those changes. As teacher attitudes toward technology use are the strongest predictor of technology adoption and use (Buckenmeyer, 2010), it was important, as Dede (2009) said, that both administrators and teachers "unlearn the beliefs, values, assumptions, and cultures underlying schools' industrial-era operating practices" (p. 3) in order fully to engage with technology for 21st century learning.

Changing Beliefs and Pedagogy

Research on changing teacher beliefs toward technology use showed the complexity involved in doing so. Ertmer and Ottenbreit-Leftwich (2010) found that unlearning the beliefs, values, and assumptions required changes in teacher knowledge, changes in teacher beliefs, and changes in teacher culture. Furthermore, teachers needed to "own" this new definition (p. 277). Zhao and Cziko (2001) proposed a model they called the Perceptual Control Theory (PCT), which identified three conditions that needed to be met for teachers to use technology in instruction:

1. The teacher must believe that technology can more effectively achiever or maintain a higher-level goal than what has been used;
2. The teacher must believe that using technology will not cause disturbances to other higher-level goals that the he or she thinks are more important than the one being maintained; and,
3. The teacher must believe that he or she has or will have the ability and resources to use technology. (p. 6).

However, encouraging teachers to change beliefs was not easy. Borko and Putnam (1995) indicated that professional development alone could not make teachers change their beliefs. They stated that "workshops alone did not change these teachers. It was listening to their own students solve problems that made the greatest difference in their instructional practices" (p. 55). My fifteen years of experience in providing workshops and individual instruction to help teachers change their beliefs corroborate Borko and Putnam's statement.

Interestingly, there was a paucity of studies examining changes in administrator beliefs on technology use. Research generally focused both on changing teacher beliefs and on how those changes were more successful with a supportive administrator (Ertmer, Bai, Dong, & Khalil, 2002; Hew & Brush, 2006). However, a study by Rakes, Fields, & Cox, (2006) found that personal computer use contributed to a greater use of technology in instructional practices and suggested future research on teacher beliefs explore the link between the personal ability to use technology effectively and the beliefs regarding technology's potential effect on student achievement. This was a gap in the research that this current study intended to address by examining the beliefs toward technology use of all technology leaders, including teacher leaders. The next section outlines the leadership framework that was used in studying technology leader beliefs.

Technology Leadership as an Adaptive Challenge

The framework of *adaptive leadership* by Heifetz (1994) is concerned with the work that leaders must do in order to manage the changes in an organization when there are conflicts between the values, beliefs, and/or behaviors within the organization that cause its members to resist any changes being made. Technical work, on the other hand, is work that leaders can address with a "fix," such as bringing in an expert or providing more education to an employee (p. 73). This type of work is referred to by Heifetz as "Type I situations" (p. 74) in which there are clearly defined problems with solutions. Type II situations, according to Heifetz (1994), are situations in which the problem is defined but no clear-cut solutions were known. I believe the technology leadership interactions seen in Dexter (2007) exhibit both Type I and II characteristics. How people communicate together, whether it be e-mail, phone, or meeting, is a Type I problem. Determining who should be talking to whom at the various levels in the school

or district, or what should be discussed between individuals in the different levels, may be a Type II problem.

Adaptive work was the basis for Type III situations, which are situations in which the problem is not clear cut and no technical fixes were available (Heifetz, 1994) and stem from a conflict in the values and beliefs of those involved. In order to overcome this conflict, leaders strive to "induce learning" (p. 75) in situations where the people involved have first to learn new things in order to gain perspective on and awareness of the problem, and then have to learn additional information in order to overcome the problem. The adaptive work is seen as difficult work and requires changing beliefs and facing up to and making adjustments to "harsh realities" (p. 76) in order to get to a solution.

Perhaps the inability to "unlearn beliefs" about technology use for student learning was a Type III situation. If so, then the issues I related to from my own experience, and found in the literature in Maine and nationally, might have been adaptive challenges that were addressed inappropriately by technology leaders; Type I or Type II fixes may have been tried but would have been unsuccessful as the conflicts in beliefs would not have been addressed. Therefore, this study also gathered data on the beliefs of technology leaders related to technology use in instructional practices and for enhancing student learning. Additionally, data was collected on efforts the technology leaders were taking in mobilizing teachers and staff to use technology for enhancing student learning. The expected behaviors included alleviating anxieties to a level that staff can work with; encouraging staff to innovate and problem solve; controlling available information being given to staff about changes that are happening. and mobilizing all stakeholders in making changes (Heifetz, 1994).

The analysis of technology leadership using the distributed leadership framework and the analysis of technology leadership beliefs as an adaptive challenge constituted the core conceptual pieces underlying this study. These conceptual elements formed the conceptual framework that was used to guide this study.

Conceptual Framework

According to Maxwell (2005), a *conceptual framework* is "primarily a conception or model of what is out there that you plan to study, and of what is going on with these things, and why" (p. 33). Figure 1.1 shows the conceptual framework created for this study. The top of the diagram covered the nature of technology leadership, and roughly depicted the elements of distributed leadership as discussed earlier in the chapter: there were multiple technology leaders, both formal and informal; followers were a part of the situation; and there were interactions between leaders and between leader and followers. The technology leaders, the followers, and the interactions among all of them constituted the context in which technology leadership was being enacted. In the conceptual framework there was also a wider community context in which parents, community members, and state and federal mandates or directives could also influence the school district context.

The technology leaders and followers together performed activities, such as professional development for staff in using and maintaining technology, purchasing new technology, repairing existing technology, and maintaining staffing to aid in these efforts. If differences in the beliefs among the staff doing these activities were treated as technical challenges, then the student outcome was what had been seen in the literature about technology not being used to its

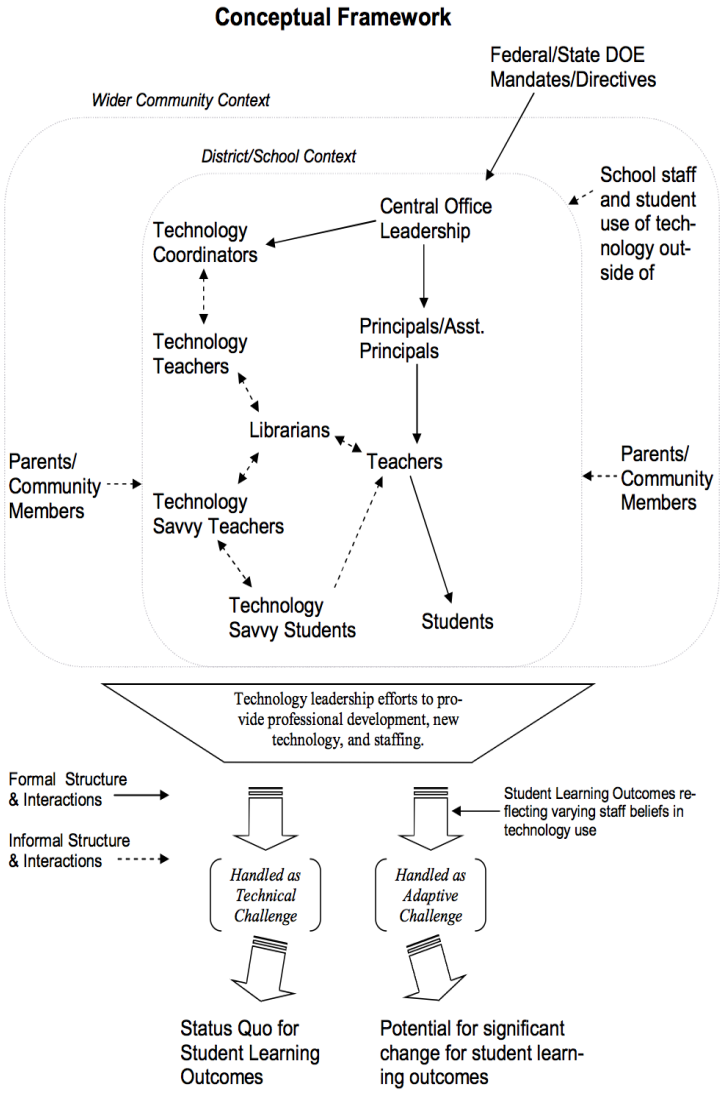

Figure 2.1 Conceptual Framework.

full potential. If the differing beliefs were seen and acted upon as an adaptive challenge, then the outcomes would be increased student outcomes using technology for learning.

In summary, this literature review examined research on technology leadership in order to set the context for the conceptual framework guiding this study. The review covered the beginnings of technology use in schools and examined who were considered technology leaders, both formal and informal, in public schools. This led to the examination of studies looking at

technology leadership as a distributed activity. The framework of adaptive leadership by Heiftez (1994) was proposed as a way of examining the technology leader's beliefs on technology use in the classroom. The following chapter explains and justifies the methodology used in the study.

CHAPTER 3

RESEARCH DESIGN

The purpose of this qualitative multi-case study was to describe and understand the nature of technology leadership in three Maine public school districts and explore the values and beliefs of technology leaders in those schools. This study built on prior research in technology leadership as described in the literature review. The conceptual framework developed at the end of the literature review was used as the starting point for data analysis in this study. This current chapter provides a description of the study's research methodology beginning with the rationale for the research approach and use of the case study method. The sampling procedures, data collection, and data analysis methodology are described, followed by the ethical matters, trustworthiness, and limitations of the study. The three research questions that guided this study were:

1. What are the roles and responsibilities of technology leaders in three Maine public school districts?
    a) How are technology leadership responsibilities shared and distributed amongst the technology leaders and/or other teachers and staff?
    b) What is the nature of communication and interaction between technology leaders and other teachers and staff?
2. What are the values and beliefs of the technology leaders concerning the use of technology?
    a) What are the technology leader's beliefs about the use of technology in instructional practices?
    b) What are the technology leaders' beliefs about the student's use of technology for

enhancing learning?

3. How do technology leaders mobilize stakeholders in using technology to positively influence student outcomes?

Research Approach

Qualitative research is best used in understanding a research problem where the variables are not known and there is a need to explore (Creswell, 2011). According to Maxwell (2005), qualitative research is also well suited to studying situations or people because it emphasizes words and not numbers. This study of technology leadership involved people and the interactions among those people; as a result, the major source of data was words and the meaning behind the words with a focus on learning from the participants through exploration (Creswell, 2011). Five intellectual goals outlined by Maxwell (2005) illustrate the usefulness of qualitative research in understanding this type of phenomena. Qualitative research is useful in (a) understanding meaning for the participants, events, situations, and actions in the situation, (b) understanding the context in which participants act and how context influences the actions of the participants, (c) identifying unanticipated phenomena and influences and being open to possible changes in design and focus, (d) understanding the process by which events and actions take place and not just the outcomes, and (e) developing causal explanations through an emphasis on understanding processes and mechanisms in the research (p. 23).

These goals stand in contrast with the goals in quantitative research, in which the goal of the research is to measure the degree of correlation between two or more variables, identify trends in a population, or seek to test whether an educational practice makes a difference by use of an intervention (Creswell, 2011). It would be possible to identify and study the correlations between specific variables or perhaps seek to study an intervention concerning technology

leadership. However, I believe that the goals of qualitative research provided a greater understanding of technology leadership's complexities. In the literature review, I showed that there were a number of school personnel who could be considered technology leaders, and there were a few studies that examined the interactions among these participants, the context in which they worked, the processes by which they worked, and the beliefs that these participants used to attribute meaning to the work they did. As noted from Maxwell (2005) above, the qualitative method is best suited among the research traditions for exploring the interactions among participants, the context in which the participants operate, and the processes by which these events and actions take place. Therefore, I believed the qualitative method was the best research method for exploring technology leadership.

Case Study Design

Within the framework of qualitative research, this study was most suited to case study design. According to Stake (1995), a case study design is appropriate when there is a need for general understanding or insight into a research problem, and the study of technology leadership in other school districts separate from the researcher's district qualifies the case study as an instrumental study. The use of a case study was chosen to "understand something" (p. 3) about technology leadership as practiced in public school districts in Maine.

According to Creswell (2011), a *case study* is also an in-depth exploration of a bounded system using extensive data collection. Several features of the phenomenon being studied favored the use of case study design: (a) cases were individuals or groups, events, activities, or sites; (b) cases represented a process that contained a series of activities; (c) cases were chosen because they were unusual and worth being studied; (d) multiple cases were studied at one time in order to provide insight into an issue, and (e) the researcher could develop an in-depth

understanding of a site via the use of multiple forms of data such as interviews, documents, surveys, or focus groups (p. 465). Using the conceptual framework created in the literature review as a guide, a *case* consisted of the individuals who were leading technology in a school district, the buildings in which they worked (which included all of the schools and the central office), and the activities, beliefs, and values of the technology leaders. Therefore, the bounded system for this study was the school district as this followed the definition of a bounded system as a setting or context within which the case was found (Creswell, Hanson, Clark Plano, & Morales, 2007).

Multiple Case Study Design

As the nature of the technology leadership found at a site could vary substantially from district to district (Dexter, 2011), both in the distribution of technology leaders and of the beliefs of those leaders, this study also examined multiple cases (Creswell, 2011). This allowed for an integrative and emergent approach for data analysis in which the addition of the other cases allowed for the comparison and contrasting of data between cases (Bogdan, 1982). Therefore, site selection was geared toward choosing sites that provided contrasting distributed leadership configurations and beliefs among the technology leaders. The next section explains the site selection process.

Site Sample Selection

The site sample that is selected for a case study should allow for the richest description possible. Purposive sampling is a process of deliberately choosing sites that will yield the most relevant and bountiful data (Yin, 2011). Creswell (2011) states that purposeful sampling is used in order to learn about and understand a central phenomenon by seeking out "information-rich" sites (p. 206) that yield the most data. Maxwell (2005) listed four goals for purposeful selection

that I believe aided in providing an in-depth analysis of technology leadership in Maine public schools. The first goal is that the site selection will choose sites that are typical or representative of the settings, individuals, and activities being studied. The second goal is to ensure that site selection captures the entire range of variation of the phenomenon being studied. The third goal is to deliberately examine cases that are critical to the theories in the study, and the fourth goal is to choose sites that allow comparisons in order to find differences between the settings and individuals. Yin (2011) cautions that chosen sites should yield data showing different views related to the topic being studied, as such data will aid in testing rival explanations and help in avoiding bias in the study. Maine public school districts range from urban school districts to rural districts (MDOE, 2013) but there was limited information statewide on what technology leadership configurations existed among the schools. In keeping with the goals of purposive sampling just discussed, site selection consisted of sites that had typical technology leadership configurations for the size of the district yet also accounted for variation in the technology leadership configurations.

Maxwell (2005) states that site selection decisions may require knowledge of the setting chosen for the study. Therefore, sample site selection and the bounding of the sample sites were guided by the criteria identified in the literature review. There are several criteria that a sample site must meet. First, the people involved in leading at a school level include principals, technology coordinators, or technology teachers. Second, officials such as the superintendent, assistant superintendent, or curriculum coordinator must provide leadership at the district level. Third, other possible technology leaders both inside and outside schools include classroom teachers, librarians, vendors, or parents. Fourth, some sort of technology committee or group must be present. Fifth, there must be evidence of technology leadership activities such as a

district or school website, meeting minutes, or administrative team agendas. Sixth, goals or vision statements should be developed at the district and/or school level. Seventh, budget figures for technology at the school and/or district level should be delineated. Finally, there must be evidence that technology is regarded as a school priority—e.g., technology being included in professional development or technology regarded a part of strategic plan for district and/or school.

Another consideration for the selection of a sample site was the use of a key informant, who was an individual having experience at a sample site that could provide insight as to what is happening at the sample site (Bogdan, 1982). Possible key informants for this study were other district technology coordinators and principals at the sample sites. Maxwell (2005) mentioned the feasibility of access and data collection, and having key informants at each site aided in my gaining access to the research sites to perform data collection.

Using purposive sampling as the guide, three case sites were identified that I believed would yield the most relevant and bountiful data (Yin, 2011). While an initial list of 30 possible sample sites was proposed, it was conjectured that three case sites that had already been considered would provide data on the different views and rival explanations that were desired for analysis (Yin, 2011). Therefore, the survey found in Appendix A was not sent to the superintendent of schools at any potential sample sites.

Snowball Sampling

Following sample site selection a participant "gatekeeper," perceived as the person controlling access to the research site (Jupp, 2006, p. 126), was identified at each site in preparation for approval to perform research. I contacted the gatekeeper and received approval for access. Once approval was granted, I identified and contacted the informant, who was

someone knowledgeable about the technology leadership configuration at the site, was a participant, and aided in selecting other participants. Participant sampling was accomplished using the snowball sampling method of selecting participants through contact information provided by other informants. The new informants lead to other informants, who can then lead to other informants, and so on (Noy, 2008). Snowball sampling was an appropriate method for technology leadership sites, as this method is especially suited for finding participants of a "hidden population" (Heckathorn, 2011, p. 356). The possible participants of a technology configuration may have been informal leaders and thus unidentified; the snowball sampling method aided in identifying the potentially hidden participants for inclusion in data collection.

The focus of this study was to understand what technology leadership looked like and to identify and understand the values and beliefs of technology leaders; therefore, it was implied that the types of roles of the participants would vary from site to site. This was to allow a comparison among the three cases of how technology leadership was implemented with the different technology leadership configurations. Light, Singer, and Willett (1990) suggested four criteria be used in identifying the target population: inclusion criteria, exclusion criteria, expected effect size, and feasibility. Inclusion criteria should ask "Why?" (p. 44)—i.e., why certain participants are studied—and there should be a sound rationale for including participants in a study. The inclusion criteria I used stemmed directly from the literature review; the participant pool was made up of individuals who were identified as being potential technology leaders. The exclusion criterion was therefore any position in a public school that was not identified in the literature as being a technology leader. Concerning the expected effect size, the assumption was that the technology leaders identified in the literature would provide the largest effect, so those positions in the public schools were included in the initial participant pool.

However, participants identified as informal technology leaders via snowball sampling were also included for data collection.

Informed consent was obtained from the participants who agreed to be part of the study (see Appendix B). Once consent was granted from all of the participants, visits were made to each case study site collect data. Visits were coordinated with the gatekeeper identified at each site.

Data Collection

This study of technology leadership in three Maine public schools studied people involved in the leading of technology. Data was collected from each of the three public school districts chosen for the study, with each school district being considered a case. As people and the interactions among the people were the major source of data, data collection consisted of interviews with the technology leaders identified from the snowball sampling process (Creswell, 2011). Documents were collected from each case as well. The following paragraphs detail the interview and document collection processes that were used for the study.

Interviews. Following participant selection and consent, interviews were conducted at each school using an interview protocol with semi-structured questions (see Appendix C) in order to allow for participants to give individual responses to questions. The use of semi-structured interview questions allowed for open-ended questions that had a specific intent (McMillan & Schumacher, 2009) while also adding structure to the data collected for use in the comparative analysis (Guest, Namey, & Mitchell, 2012). Notes were taken during the interviews, and the interviews were recorded using a digital mp3 recorder.

The interview questions were designed to gain an understanding of the participant's experiences with technology and to have the participant tell about the ways in which technology

leadership decisions are understood and affect the day-to-day teaching and learning of students. The interview questions probed the participant's beliefs and values concerning the use of technology as an instructional tool and as a tool for student learning. The interviews were conducted in a private room and recorded using a digital recording device in mp3 format. The recording device was locked in a file cabinet when not in use. The recorded interviews were downloaded to my computer and stored in mp3 format in a password-protected folder on the computer. The interviews were transcribed into Microsoft Word documents, and the names and places in the transcript were anonymized. These transcriptions were also stored in a password-protected folder on the computer. Printed transcripts were locked in a fireproof cabinet when not in use. No follow-up interviews were deemed necessary. Member checking was performed by sending the transcripts to the participants via email in order to check the accuracy of the transcription. Anonymized data was kept on the researcher's computer during the study. The key linking the participants' names to the data was destroyed after data analysis was completed, and all data will be destroyed after five years.

Document collection. In order to examine more fully the roles and responsibilities of technology leaders, document analysis of web sites, meeting minutes, technology plans, and other documents of interest (such as damage rates, repair rates, lost and stolen rates, and behavior infractions on technology) were seen as ways of providing "valuable information" and corroborating evidence about the central phenomenon of technology leadership (Creswell, 2011, p. 223). District or school web sites showed evidence of technology resources, but only one case site included a vision of learning for technology. There were no minutes of technology-oriented meetings that might have showed evidence of who was actively involved in technology decision-making, who interacted among technology leaders, or what was budgeted for technology.

Technology plans did provide an inventory of the school district's equipment, and beliefs concerning the use of technology for learning were stated within the statement of the vision for technology use.

The collection of documents (see Appendix E) aided data analysis by adding additional sources for corroborating collected data. Multiple perspectives in data collection were important in "provid[ing] several viewpoints from different individuals and sources of data as evidence for a theme...[m]ultiple perspectives are important when conveying the complexity of a phenomenon in qualitative research" (Creswell, 2011, p. 250). The next section covers how the interview data and documents collected were analyzed in this study.

Data Analysis

Data analysis followed the strategies outlined in Maxwell (2005) for analyzing qualitative data and were guided by the conceptual framework created in the review of the literature. The first steps were listening to the interviews, creating and reading the transcripts, and reading the documents collected. During the process of listening to and transcribing the interviews and reviewing the collected documents, memos were created in order to capture my thoughts on the data. A sampling tree or "stemmata" was used to keep track of the course of the sampling process (Noy, 2008). Transcripts were analyzed using a "bottom-up" approach, where relevant text segments about the central phenomenon were assigned codes in order to aid in the development of themes (Creswell, 2011, p. 237). Inductive analysis aided in developing a general picture of the data using descriptions and themes in order to represent the findings as narratives and visuals; I then interpreted the meaning of the results by "reflecting personally on the impact of the findings and on the literature that might inform the findings" (Creswell, 2011,

p. 237).

Document analysis of web sites and technology plans was a part of inductive analysis. According to Bowen (2009), coding and category construction can be applied to documents to help uncover themes pertinent to the phenomenon. For example, the codes used in interview transcripts were applied to the content of the various documents found, thereby adding corroborating evidence as to the validity of the theme observed. As indicated by Bowen (2009), I followed a process of performing a superficial examination of the documents known as *skimming*, then performed a more in-depth reading of the documents that Bowen called a *thorough examination*. The final stage of document analysis was *interpretation*, where I applied coding to the documents as part of the larger data analysis for themes (p. 32).

Concurrent with the process of writing memos and coding the transcripts and documents, I organized the data with what Maxwell (2005) called the *organizational*, *substantive*, and *theoretical* categories. The three research questions driving this study were to explore the roles and responsibilities of technology leadership in three Maine public school districts, explore the values and beliefs among technology leaders concerning the use of technology, and determine how technology leaders mobilize stakeholders in using technology positively to influence student outcomes. Answering these three questions required different perspectives on the collected data.

Organizational categories were the first step in this analysis. *Organizational categories* are "broad areas or issues that you establish prior to your interviews or observations, or that could usually have been anticipated" with data sorted into those "bins" (Maxwell, 2005, p. 97). The initial list of criteria for organizational categories for this study included technology

leadership roles, formal versus informal leaders, interactions, readiness to lead, professional development, beliefs about the use of technology in instructional practices, and beliefs about the use of technology in instructional practices.

The second step in data analysis was using substantive categories. *Substantive categories* are "primarily descriptive, in a broad sense that includes description of participants' concepts and beliefs; they stay close to the data categorized, and don't inherently imply a more abstract theory" (Maxwell, 2005, p. 97). In this step, I gained an understanding of what I was seeing in the data and described it from the participants' perspective, while also including my own description of what I saw was happening.

The use of theoretical categories helped me in organizing the data to answer the three research questions. According to Maxwell (2005), *theoretical categories* are the researcher's concepts of what is when compared with the participants' concepts. Theoretical categories may be "derived either from prior theory or from an inductively developed theory" (p. 97). The two leadership frameworks that were part of the conceptual framework for this study, the framework of distributed leadership (Spillane, 2006) and the framework of adaptive leadership (Heifetz, 1994), were the starting point for the creation of theoretical categories, but other theoretical categories emerged from the data analysis organically.

The memo writing, coding, and creation of organizational, substantive, and theoretical categories informed the development of the three case studies. *Cross case analysis*, informed by the research questions, provided the comparison and contrasting of data between cases (Bogdan, 1982). A cross-case analysis highlighted the similarities and differences between sites and aided in preventing premature or false conclusions by looking at the data in divergent ways (Eisenhardt, 1989).

Together, the organizational, substantive, theoretical categories, and cross-case analysis were used to find connecting strategies as described by Maxwell (2005). In this part of the data analysis, I utilized the categorized data to look for relationships amid the different contexts in attempting to understand the nature of technology leadership and both the values and beliefs of the technology leaders and the mobilization of the stakeholders in using technology positively to influence student outcomes.

Ethical Matters

Participation in the qualitative study was completely voluntary, and each participant had the option of dropping out of the study at any time. Each participant was informed of the research objectives, data collection, and data collection devices and signed a consent form before being included in the study.

Trust was the key ethical consideration in conducting this study. Participants were asked to share information and/or opinions about co-workers and/or supervisors concerning technology leadership in their schools, and in some cases this information or opinions may have been unflattering, placing the participant in jeopardy. Providing a location and atmosphere where the participant was comfortable sharing possibly unflattering information or opinions, and being upfront about how this information or opinions would be safeguarded, were accomplished in order to establish a trustful relationship between the researcher and participant.

Additionally, I had not previously worked and did not work at the time of the interview with any of the participants in the study and had no influence over the professional evaluations of the participants. However, due to the nature of the study with potentially unfavorable opinions being offered, there was the possibility that a decision to participate in the study could affect performance evaluations or job advancement opportunities for the participants, even if it was

only the employee's perception that this was the case. Participants were made aware of this risk in the informed consent form, and if they chose to participate in the study, they were reminded during interviews of the risk.

Trustworthiness

The site and participant selection were designed to maximize the validity and reliability of the data, as typical schools and participants were deliberately chosen to provide variant views of technology leadership practices for analysis. The expectation was that the three sample sites would provide rich and varied data concerning technology integration practices. Issues in trustworthiness for this qualitative study were mitigated via credibility and member checking. *Credibility* is the suggestion that the findings will be accurate and credible from the standpoint of the researcher, participants, and reader, and is a key component of the research design (Maxwell, 2005). *Member checking* can enhance the coding and interpretation of the transcripts by allowing the participant the chance to confirm observations and participants' meanings (McMillan & Schumacher, 2009).

I acknowledge that my experiences as a technology director/coordinator were a liability and might have potentially biased the research design and interpretation of findings. In addition to the assumptions being made explicit at the beginning of the study, I engaged in ongoing critical self-reflection by way of journaling and dialogue with professional colleagues and advisors. Also, in order to strengthen the credibility of the research, procedural safeguards such as triangulation of data sources and methods were also employed. I lead technology integration in a public school system, so the opportunity for bias and assumptions was ever present and might have influenced my interviews with participants. During transcription and analysis, I attempted to be open to disconfirming data and results due to the years of experience the

researcher has in leading technology integration. Member checking with a colleague aided in providing an alternative viewpoint of the data analysis in order to minimize any bias and assumptions on my part.

Limitations

My goal for the choice of a multi-case design was to allow for the possibility of making "naturalistic generalizations," which are generalizations that are not propositional in nature but seek instead to construct generalized findings from the experiences of the case study participants (Stake, 1995, p. 85). There was also the risk that a lack of data or of reliable data might limit the scope of the analysis.

As this was a qualitative study, a major source of data collection was interviews, and that source of data included the risk of bias. There existed the potential for selective memory issues, where participants remembered (or did not remember) events that occurred; telescoping, where participants recalled events as occurring at one time when they in fact occurred at different time; attribution, or association by participants of positive events and outcomes to themselves and of negative events and outcomes to other people or events; and exaggeration, or representation by participants of outcomes as having been more significant than they actually were (Orrico, 2015).

CHAPTER 4

CASE STUDIES

This chapter provides a description of the three case study sites used in this study: Big Valley School District, Broad River School District, and Grandview School District. Each case study description will open with an introduction that will provide some basic information on the school district and diagram the technology leadership organizational structure. Next, an examination of the roles and responsibilities of the technology of the different technology leaders will be presented, followed by the values and beliefs of those leaders concerning technology. The decision-making process for technology and communication patterns among the technology leaders and teaching staff will then be described for each case study site, followed by descriptions of the technology leader's views on the use of technology by students and the professional development provided to technology leaders. Finally, each case study will conclude with a summary of each site and how each of the technology leaders feels their school or district is doing with regards to technology as compared to other schools in Maine.

Big Valley School District

The first case study site, Big Valley School District, is a small rural town in Maine with a population of just over 1,500 people (according to the 2010 census). There are two manufacturing businesses in town along with a variety of smaller businesses but no hospital. The public school district once had five different schools to service grades K-12, but due to declining enrollments over time now has only two schools: one Pre K-6, the other 7-12.

The Big Valley School District maintained a public Internet web site containing a technology section listing the names and contact information of the director of technology and the technician. Technology plans were available as PDF files on the technology web page and

showed that the latest plan was due to expire in 2018. The technology plan contained all of the elements required by the Maine Department of Education for technology plans at that time. The Big Valley School District had a vision statement, mission statement, and a technology vision statement in the current technology plan; however, they had been removed from the district web site the time of this writing for unknown reasons.

The technology committee was responsible for the creation of the current technology plan. Members of the technology committee included the director of technology, superintendent of schools, curriculum coordinator, adult education director, special education director, both principals, the district librarian, a parent, and four teachers from the schools. It was unknown if the technology committee had met since the current technology plan was adopted in 2015. The school board's curriculum committee and policy committee were stated to have been involved in establishing goals, action strategies, and evaluation guidelines for technology and technology integration into the curriculum.

The initial contact with the Big Valley School District was Marge, the technology coordinator. As can be seen in the organizational chart for Big Valley School District, (see Figure 4.1), Marge was positioned in the leadership structure as being directly supervised by the superintendent of schools. She also supervised one employee, the computer technician, and was a member of the administrative team along with the guidance director, curriculum coordinator, two principals, and special service director. Marge did not have any formal supervisory authority over teachers.

The position of Director of Technology was listed in the Big Valley School District leadership structure as part of the administrative team. This organizational structure was used in other school districts in Maine and was one of the organizational structure variations being

examined in this study. The title “Director of Technology” was a recent change, as the title was formerly called “Technology Coordinator” at Big Valley. In the other two cases, there was a technology coordinator at one district and an acting technology coordinator in the other district.

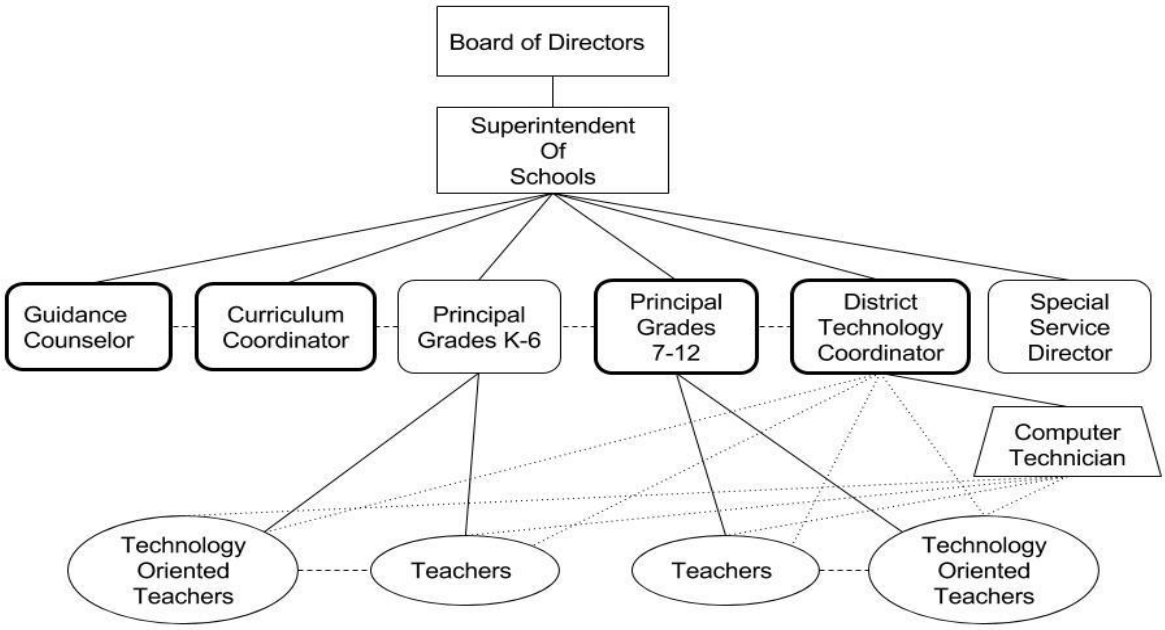

Figure 4.1. Organizational Chart for Big Valley School District with formal/informal connections between staff.

As this study used the snowball sampling method, in which participants were selected through information provided by other informants (Noy, 2008), Marge was asked who she believed were other technology leaders at Big Valley. Marge listed the guidance director, Joan, the curriculum coordinator, Susan, and the grade 7 through 12 principal, Philip, as technology leaders. Snowball sampling from Marge, Joan, and Philip also identified a high school science teacher, April, as a technology leader from among the teaching staff.

The Roles and Responsibilities of Technology Leaders

The roles and responsibilities of the technology leaders strictly followed the technology used by the participants in the jobs they held. The district technology coordinator, Marge, was the acknowledged person in charge of technology. The guidance director, curriculum coordinator, principal, and science teacher had such a high level of trust in Marge that they deferred to Marge in all technology matters and focused on using the technology in their respective jobs to the best of their abilities. Here is a brief synopsis of how the roles and responsibilities of the technology leaders in Big Valley School District.

Marge. Marge had been in education for over 30 years and as a teacher was an early user of computers in the classroom. Over time she became the go-to person for technology matters, and moving to the technology coordinator position merely formalized the role she had played in technology leadership within the school district for many years. Regarding technology duties, Marge said she did "every one of them!" She ran wires, worked on databases, created technology budgets, ordered technology items, prepared request for proposals, and evaluated quotes from vendors. She felt that her training in industrial technology, which taught her how to look at how systems work and improve on them, was still valuable to her in the technology coordinator role. The lone computer technician reported to Marge.

Joan. Unlike Marge, the guidance director, Joan, who had been in education for ten years, had only been with the school district for two years. She oversaw the guidance department and sometimes covered for the assistant principal and special service director. Joan did not consider herself a technology leader per se but used technology for the majority of her job functions and for dealing with student social media issues. The technology that Joan used daily was mainly the student information system (SIS) for working with student scheduling and

managing staff permissions for the SIS access. Since Joan was unfamiliar with that SIS, Joan "literally sat in a room with those two ladies [Marge and the curriculum coordinator] for a full week" in order learn how to use the SIS. When it came to inputting data into the SIS, Joan said "I don't trust other people to put data in that I need," and that "either I do it myself, [or] Marge, who is technology [coordinator], or the curriculum coordinator, puts it in."

Concerning the actual leadership of technology, Joan was a part of the administrative team for the district and as such was involved in many discussions about technology with the team. She did feel that staff had the opportunity to give feedback on how students were using technology devices in the classroom. Joan also said that she had input into what professional development was done for district and was a recipient of the professional development offered by the district, which included both one-on-one help and scheduled activities.

Susan. The curriculum coordinator, Susan, who had been in education over 30 years as a technology teacher and a technology consultant, was the curriculum coordinator in the school district and had been for four years. She oversaw the district curriculum and worked with the guidance director, Joan, on creating the district master schedule in the student information system. Susan also ran reports out of student information system and oversaw the online federal grants budget. Concerning the leadership of technology in the district, Susan said she did not "need and don't attempt to overlap" with Marge but would be more involved in technology matters if she did not trust Marge's abilities. Susan felt that "because there's a huge faith in [Marge's] ability, it allows me to just focus" on curriculum. She added that if she were "not as trusting of the person who is running our tech" she would have to be "paying far more attention" to instructional technology. Susan had "a huge faith in [Marge's] understanding and respect for that understanding."

Philip. Philip, the grade 7-12 principal, had been in education over 30 years as a teacher and principal but also had been in the school district for only two years. He was a principal/technology integrator at a prior school but did not normally deal with technology as part of the principal duties in his current school. Concerning the technology budget for his school, Philip did not feel the need to get involved in making the technology budget since Marge did "an amazing job of getting things for the school." Being new, Philip felt that technology matters were Marge's "realm" and did not want to "ruffle feathers just yet," as he was not yet that established in the district; he did feel that he could be of assistance, though, in helping Marge with some of the duties of technology leadership if he was asked to help.

April. The science teacher, April, had been in education over 14 years as a teacher and used technology every day in class for teaching. Items she used were a digital projector, document camera, iPad, and science probes. April also used an online resource to organize student work such as homework assignments and tests, which were kept electronically.

April had also written grants to get new technology, but she felt that was the limit of her contribution to technology leadership. She did keep a pulse on what other teachers were saying about technology and related that most of the teaching staff was not in favor of keeping iPads during the technology refresh, and were upset about the possibility, but found that most teachers were pleasantly surprised to hear that the upgraded iPads being offered in the refresh corrected many of the shortcomings that last year's model had. April did not know if there was a technology committee or not in her school or district.

In summary, the district technology coordinator, Marge, performed the roles and responsibilities of technology leadership and was one of the few people Joan trusted for putting confidential data into the district SIS. Marge was also trusted by Susan when working with

teachers on instructional technology matters. However, it was shown that Philip, the principal, felt he could be helping Marge with some technology items but resisted doing so as he did not want to "ruffle feathers" with Marge or the other technology leaders. The science teacher, April, also stayed focused on the technologies she already used in her classroom. One thing all of the technology leaders agreed upon, though, was the importance of technology use in the school or district; the next section will examine the values and beliefs of the technology leaders in Big Valley School District.

Beliefs in the Value of Technology

At the time of this study, the technology leaders in Big Valley School District had been pioneering the use of technology in classrooms for many years. Marge, as the technology coordinator, was the primary leader in this process. However, many other people, including Susan, who had worked as a consultant with the school district before being hired, worked with Marge to bring forward the vision of technology use in the Big Valley School District. A few of the technology leaders working in the Big Valley School District had only been with the district for a few years, but many of the beliefs that these newer technology leaders held and valued regarding the use of technology were similar in some ways to, yet also different than, the beliefs held by Marge and Susan.

Marge believes that technology is an improvement over nature—digital technology is just another tool to use—and said "[w]ithout the technology I wouldn't have a job!" In her job as the technology coordinator, Marge uses a laptop, smartphone, and iPad every day in some capacity. She related that "if I don't have at least one of them I'm probably fairly lost in terms of trying to get my job done" but also says that the technology she uses "could also be a hammer and a saw and, you know, my toolbox is right there next to my laptop bag so they don't get too far

separated.” The value of technology to Marge is not related to her job duties; Marge believes that the value of technology is that it could “give those kids those opportunities to have access to resources...we can't normally give them to have, experiences that we're not going to be able to get.” Without technology skills, Marge believes that the students will not “be employable” and will not “be able to make their way in the world as we know it” as the world is “changing rapidly.”

Marge also believes that the flexibility of the technology is a great asset. In her view, each department has different technology needs; the biology class has different needs than the math class, which has different needs than the English class, which has different needs than the music classroom, which might, for example, require a special cable to do orchestral work. “The cool part was giving people the tools they need that can be that flexible.”

Joan views technology “as an asset” that helped make her “job a little easier, a little less paperwork, and little more mainstream.” Joan values the quick access to emergency contact information from her phone, which was not always possible before. She says that you can “watch any of the admin and we all have a device with us at all times because that's our lifeline.”

However, when viewed from the context of the students, Joan thought that technology “would be a huge asset if it was used to its original purposes and to its full intent.” Looking at technology from “a social aspect,” Joan thinks of technology as “a nightmare” because she has “to deal with all of the social issues that come through the students” and “the negative stuff” (e.g., out-of-school bullying via social media that carried over to in-school interactions) that comes “back into the school” causing issues.

Like Marge, Susan believes that all technology is a tool, “like a pencil,” and that students should have technology in order to help them learn. Susan values technology as it makes her

curriculum coordinator job more efficient; she hates “to waste time” and said “if technology can do it faster then I want it, I want us to be using it to do that so that we're not wasting time.” Susan also believes that technology allows teachers to “put more knowledge, more relevant and relative knowledge at the disposal of the child then without it,” and so believes that technology has an “unbelievable potential” for helping students learn.

However, even though Susan has an extensive background in technology and was an early user of computers for learning, she believes that for students, good instruction is more important than technology. This view on the use of technology developed as a result of her grounding in a “solid instructional program” from her master’s degree in curriculum and instruction, where “the whole focus was on designing good instruction.” Susan particularly does not like it “when the tool becomes the focus” and is unhappy with the change that had been made three years earlier from the MacBooks to the iPad as the primary device in the MLTI program; she felt that “the iPad was not supposed to be the tool that we forced it to be in classrooms.” Her worry is that instead of focusing on instruction, the focus will be “more on the tool,” and student learning will suffer as a result.

To the principal, Philip, technology is “exciting and wonderful opportunities for learning.” He considers himself “a very technological oriented administrator” and values being able to use technology to “go anywhere and get access to anything” because everything he needs is “in the cloud.” With teachers and the use of technology, Philip believes that in the school “the issue is not the availability and support of technology from the central office or central people”; instead, the issue is the lack of “the willingness of teachers to go a little bit further” with technology. He believes if the teachers have less technology, “they'd value it more and say ‘Geez, I better, you know, use this’.” Philip believes that technology has become “a way of life”

for the teachers but that the teachers have “never really done too much innovative stuff with it” with the exception of “one or two” teachers. Philip believes technology is “the wave of the future” and that there are “very few jobs that won't have to have comfortability with the computer or computing devices.” Philip believes tablets for the students are “amazing,” although too much freedom is given to the students on the devices. However, he said that when you ask a teacher what's the most frustrating thing about teaching and the answer is that “it's when the principal takes away the iPad and they have to figure out a different way to get the assignment done,” you have really ingrained technology into teaching practices.

The science teacher, April, sees technology as “using the newest digital tools at our...fingertips to enhance the curriculum and the lessons that we are doing.” She values the use of technology, as it allows for students to “be engaged a hundred percent of the time” and allows the school “to differentiate better.” She said, “How can you even compare it to what it used to — it's put... the world at their fingertips.” April also says technology is “great for peer editing,” especially when students were in mixed ability groups; her students peer edit the grammar and mistakes of other students before the work ever gets to her as the teacher. Similarly, April does many labs that utilize data collection and has her students use shared Google Spreadsheets to edit the data simultaneously both during a lab and after.

April also says that the beliefs for the teachers in her school are that technology use is the expectation, and has this advice for new staff members:

> I think [when] new staff that come here they better have...that philosophy of how they're going to use technology and why they want to use it and be ready to dive right in because it's kind of taken for granted. I think a little bit, there's a lot of support but a lot of our tech teacher leaders have really delved in - gone in elbow deep and learned it. You know

> I can't say everything I run and know I learned in a PD session, that's for sure, so really [an] important facet to a new staff ever coming here would be what they're going to do and how they go to use technology and that they are going to use it.

Together, the beliefs of the technology leaders discussed above pointed to a practical view of technology in support of student learning. Marge, Joan, Philip, and April all valued the use of technology for making their jobs easier and faster, but also valued the technology that could provide students with tools that were flexible and engaging and could give students the skills they needed to succeed after leaving the Big Valley School District. Susan, however, was more wary of technology and believed that technology should always be in service of instruction rather than the other way around.

The Management of Technology Decisions

The technology leaders Marge, Susan, and Philip made a variety of decisions concerning technology use in the Big Valley School District, including decisions about what technology the staff and students would use, how much money should be budgeted for technology, and what professional development would be offered for technology. All three leaders preferred to make those decisions with staff input, but sometimes outside factors forced Marge, Susan, and Philip to manage the decision-making process. In the following paragraphs, we will see some of the constraints that Marge, Susan, and Philip had to contend with in making and managing decisions regarding technology.

Marge likes to have teacher and student feedback when looking at changes in technology; most of that feedback is informal. However, “at some point in time the buck just kind of stops and it's got to be done.” She said that sometimes decisions are “driven by other factors” that the staff and students are not aware of, such as having a short time frame in which she has to "get

through teachers, admin team, school board, and back to the state in short amount of time." In this situation, which had recently taken place, Marge gave as much information to teachers as quickly as she could, but "other than a heads up" to the teachers, she believed the decision needed to be made at the administrative level due to the short time frame. At other times, the decisions end up being a discussion with the principal and superintendent. The available budget also factored into decisions.

However, even when there is time in making a decision, sometimes the staff could not tell her what they want, and in that case, she's "just going to make" a decision for them. Sometimes Marge goes with the staff decision even knowing that "eighty percent of the people tell you this was what they want [but] twenty percent would say you didn't do what they wanted." About this kind of behavior, Marge said that sometimes technology leadership "runs a lot better when it's benevolent dictatorship" and also said that "sometimes it's easier to get forgiveness than it is to get permission on a decision." She feels that it "keeps things entertaining."

Joan says the decision-making starts with the administrative team, is then presented to staff, goes back to the administrative team, and then is finally to the superintendent and school board. Joan says the process for making technology decisions starts with technology coordinator, who determines the path "she thinks would get the buy in." Joan says the leadership team also outlines a plan for technology for the year and runs that plan by some teachers for feedback. The plan is tried and evaluated to see what works via trial and error.

Joan believes the administrative team is used as a sounding board for big technology decisions, such as the laptop refresh that was being considered at the time of the interview; she thought this process was done informally by looking at the pros and cons of a change and then

going to staff with a proposal. She also said the administrative team sometimes uses staff surveys to get feedback on a decision. Joan says a lack of time is seen as a hindrance to including more teachers in the decision-making process, as teachers already have too many afternoon meetings in their schedule. Joan did not know if there was a formal technology committee in the district.

Susan says the administrative leadership uses team meetings or leadership meetings to try and get consensus knowing not everybody will be happy. Susan always favors a process that is efficient. She says the principal uses an ABCD decision-making method and does a good job with that method. The ABCD decision-making model provides a structure of four ways to frame how a decision is made: An A decision is where the organizational leader makes the decision; a B decision is where the leader has the decision, but the decision is made with the input of others; a C decision is a decision made by a team of people in the organization; and a D decision is a decision made by the group (EL Education, 2017). Susan says it can be frustrating when staff are involved in the decision-making process and complains about the decision after the fact. Susan believes that "sometimes you need to decide at some point there was no right answer" and that there are times when "you put your foot down" and say you have a choice and there are other times when you put your foot down and say "this was the choice." Susan also believes there is an appropriate time to make decisions with a small circle of people, an example being when a decision is needed on budgetary issues.

For Philip, ninety-nine percent of the time the decision-making process is collaborative and involves bringing the problem to the table and providing the parameters and transparency for people to understand what or where they need to go or not go. He believes the more you get teachers involved in the decision-making, the better. However, Philip says that sometimes the choice comes down to money, and that you need to justify spending more than the cheaper

alternative; if you cannot find good reasons for a more expensive upgrade, then he will not fight for it. Philip also believes the technology leaders have to look at situations differently and decide differently, as there might be extenuating circumstances such as a budget shortfall, a short time frame, or lukewarm staff responses that factor into when and how a decision is made. Philip gave an example of extenuating circumstances when he explained why the technology committee was not convened to discuss the decision on iPads or laptops:

> No, not this time around, again because I feel that both the technology coordinator and I were thinking that if we give that committee the authority and then the wrong decision was made for the wrong reasons it would be really weird to override that, so we made it clear it was...a B decision; B means that we're both going to talk about it but the final decision is an Administrative one. A is like an administrative one without any input, like fire drill, and C is when I have the same vote as the teachers, and D is I don't even have a vote you guys do it and figure it out and I'll Implement whatever you decide.

Philip wanted to get the district technology committee up and running for the next school year to help him make collaborative decisions; he felt the technology coordinator was doing a good job in her position but was overwhelmed and could use help in making some decisions.

The science teacher, April, knows the decision for technology spending goes to the budget committee but does not know if there is a technology committee. In her estimation, “a lot of it does come down to funding—we've been very fortunate to have what we have for the size school we are.”

To sum up the management of technology decision-making by Marge, Susan, and Philip, there was a sense that all three leaders preferred including teachers in the decision-making process concerning technology matters if at all possible. However, sometimes budgetary or time-

sensitive issues dictated that the “buck just kind of stops,” “you put your foot down,” or an “A” decision needed to be made. In this regard, Marge, Susan, and Philip appeared to be in agreement.

Communications with Staff

Communications concerning technology matters took place daily in the Big Valley School District, with topics of conversation ranging from managerial type activities, such as Marge needing to help someone with a laptop or Joan helping someone with a problem in the student information system, to pedagogy activities, such as Susan or Philip talking with a teacher about the use of a new technology in the classroom with students. Many of the conversations happened informally and in-person.

For Marge, communication is about technology all day, every day, with everyone, “whether I want them or not.” Marge explained that in such a small school district and community, everyone knows who to ask, and are not afraid of asking for help anytime, anywhere, even if they are third grade students:

> I mean technology is so much a part of everyday life around here that I end up talking with everybody, you know the cooks need to do their ordering and keep track of their stuff... and then the kids are all walking around with gear and if you don't think these guys are bad go up and have a third grader have a problem with their computer ‘cause they have no filter, and I was up there... one day sitting in the principal's office working... this third grader comes in and says, “Hey, flash isn't updating on my machine; you need to come up and fix it.” I'm like, “Yeah, I'll get to it when I get a’cha…”— “No! Right now! I can't get in this, I can't get in MobyMax, I can't get in my Lexia, and... I'm doing a research project that—“ “I'll be right up…” “And a bunch of my friends are having the

same prob—" Okay, sticking up for your friends... okay! They are not afraid.

Many of Marge's discussions concerning technology are "done very informally." When somebody comes up to Marge and says, "I don't know how to do this," Marge says, "You know? I saw so-and-so using that in their classroom the other day you, really ought a go check that out... they're doing some cool stuff in the classroom." Marge also enlists informal leaders when she gets new technology by giving this technology to the teachers who are the technology leaders; Marge knows sooner or later those teachers will figure out if the technology is useful or not, and "if it's any good words going to get around."

Joan, as the guidance director, spends most of her time conversing with Marge and the computer technician for support on the student information system and other technical and social networking issues. Joan also spends time talking with the other administrators and staff about scheduling and assignments in the student information system. Joan emails other staff about technology matters daily and talks with staff anywhere in the buildings, even in parking lots. Joan also gives feedback to staff on how students are using technology devices in classroom.

Susan's discussions concerning technology are usually a chat with Marge "ninety percent of the time." These discussions are about using technology more efficiently to get the job done via the student information system, email, an organizational program, or some other program or app. Sometimes Susan talks with Marge about support issues. Susan also asks for help from Marge on behalf of teachers when the technology is supporting teaching or if a teacher has a new idea on using technology and wants help. Susan talks with other staff about technology anywhere but mostly in offices and sometimes in an online chat.

Susan also tries to stay on top of "who's good at doing what" and encourages those teachers who are good with technology to share with others. Susan asks teachers to pilot new

ideas with technology in order to find out if something is worth doing in more classrooms. Susan sees teachers going directly to Marge at times to ask about using a particular technology.

Like Joan, Philip spends much of his time talking with teachers about the student information system and helping teachers use the workflow tools to boost productivity. Philip also helps teachers use the iPad apps for reading accessibility and helps teachers use markup notation to give feedback to students electronically. Philip also works with his teachers in using technology for teaching and helps his teachers "take the next step" when he gets "a chance to talk about technology for learning." Philip wonders what it means to get his teachers "above the line" and is concerned that the model of technology use that the school is using is not understood very well by the teachers. He says, "You could ask all my teachers as to what's difference between substitution and augmentation and I'm not sure they would understand that." With his background in technology integration, Philip is able to talk about technology at teacher meetings, at afternoon technology training sessions, and at regional tech workshops. Philip checks in with four teachers regularly to see how things are going with the staff. He also meets with the association monthly to see how things are going and walks around the building to talk with staff daily.

April talks with other teachers about technology, mostly the ones she considers teacher leaders. She sometimes asks Marge for help since Marge's office is right across the hall from her, but April knows that Marge is busy and tries not to bother her. April goes to the computer technician first if she cannot get help from the other teachers if she is troubleshooting an issue. There is some informal time spent by April on discussing technology, mostly at team meetings or the occasional staff meeting. April did say the school offers professional development but finds it

“hard to fit that in to get time to go to all those” so she often goes to “a colleague for that kind of stuff.”

April’s comments, and those of the other technology leaders above, indicate that technology leaders use informal, face-to-face conversations when working with staff and teachers about technology items. As seen above, it could be Marge helping students with a laptop, or Joan working with a teacher in a scheduling issue. Susan might be working with a teacher on using a new technology in the classroom, while Philip might be having a check-in with his four teachers. The technology leaders also talk with each other regularly, supporting each other with the technology they use or talking about the use of new technologies.

Beliefs about Student Use of Technology

Of the technology leaders interviewed, the four administrators all felt that the use of technology by students for learning was uneven and not being used to its full potential. The teacher, however, had nothing but praise for the technology the students were using. The following paragraphs highlight the observations of the technology leaders concerning the importance of technology for use by students.

For Marge, when it comes to looking at technology for enhancing student learning, “the problem is, who's deciding on the outcome?” She believes that for the “stuff that the students decide they want to learn, it’s a great tool.” For the things that the teachers think the students want to learn, “if the students buy in, it's a great tool.” For the things that the Federal government thought schools should be assessing in terms of outcomes, she does not think technology is effective. For the things that business and industry needs to be able to do, Marge believes technology is “a great tool for those outcomes.” She also believes it is good that school staff help students correctly understand about society, living in a digital world, and living in the online

space while still in school. Marge came to these beliefs by talking with student alumni who told her the lessons they learned about using technology while in school served them well when they went out into the world.

Marge also believes that technology gives opportunities to students, “especially out in the sticks” where the students don't get exposed to much other than what they see on television. She also believes if the students are not exposed to technology in school, they will be lost and not employable when they go out of the area to find employment. Marge believes it is important to give those kids opportunities to have access to resources that are not normally given to them.

Finally, Marge believes that a one-to-one pairing of a device with each student allows that student to do cool things and personalize the device for his or her own instructional needs. For example, each student can independently change the font size if a bigger font is needed in order to read the screen. It is also possible to lock down a screen for students with Attention Deficit Hyperactivity Disorder so those students have laptop screens with minimal clutter, and hearing-impaired students can have the screen flash instead of beep to alert them of laptop activity.

Joan believes that “technology can enhance kids learning” by providing access to the World Wide Web, which connects students to information they would not otherwise be able to access. To Joan, access to the World Wide Web provides access to contact with other people, even overseas, and helps students visit colleges via virtual college tours. She believes special needs students can use devices to help them with hand-eye coordination and speech-to-text, saying that “it's huge for them.”

Joan also sees value in parents and students having access to missing assignments in the student information system so there are no more excuses and “I didn't knows.” She sometimes

sees technology used as a babysitting tool and sees that technology can be a distractor." Joan explained that "kids are savvy and can get off track and get the three people next to them off track as well." On a plus side, Joan saw students engaging with a wide variety of programs and devices such as Minecraft, iPads, PowerPoint, Pages, CAD, 3-D printing, GarageBand, and photos; however, unevenness in what was allowed caused problems. Joan said that a lack of close parameters allows students to wander into places into which they could "really get in trouble." However, she believes technology helps students with finding multiple pathways for learning.

Susan says that technology is especially helpful for the students who are visual learners, and the technology in use in the district allows teachers to "put more knowledge, more relevant and relative knowledge at the disposal of the child than without it" and so provides students with "unbelievable potential." Her concern is that the district is not helping students take full advantage of the ways technology can help the students learn:

> [N]ot all kids are just visual processors and they need that extra piece, they need that something else, and I think that's the biggest thing that technology can do for kids but not all kids...we don't have kids trained to know how to take advantage of it, or to use it, and we don't require it enough. It's not just...a portable typewriter, you know you can write...all you want but if the writing is vacant of meaning then big deal; they spent 45 minutes writing but it's vacant of anything, any learning or meaning. Why did we just spend 45 minutes typing? So I think there's a lot more to be done and I don't know, I don't know, I don't know the cause. It's a chicken/egg thing; I don't know which you correct first. I think it has huge potential; we're not anywhere near or close to achieving that potential.

Concerning the value of technology for student learning, Philip is surprised there is not “more evidence of higher levels of learning or engagement” from the MLTI program. He wonders if “we’re looking for the wrong things...because...I don't think technology makes somebody smarter on a math test.” Philip believes there are “enough apps out there” to support good teaching and thought by now he would be seeing “higher things happening” with student learning. He wonders if part of the problem is that the school does not “do a good enough job of showing people what is good and how these things have changed lives.” Philip says “we've got to do more throughout the year to show and share” that student learning. Having said this, Philip followed up by saying that

> even knowing that I know we need to go further with our teachers, the value is incredible and that's the piece that isn't coming out with any surveys...we now have a productivity tool that is equivalent of a calculator; nobody questions a calculator...we know that these things work. They're how we actually deliver education, all you have to do is ask a teacher what the most frustrating thing is and it's when the principal takes away the iPad for a kid and then they have to figure out a different way to do it in a classroom, you know that you're really ingrained. That’s really immeasurable in a lot of ways but we know it's huge because that's the productivity environment that's going to happen wherever they go outside of school, so the value of that is huge; we shouldn't downplay that. Having said that though I think the value could be so much higher if we figure out a way to...bring in the technology to deliver the curriculum.

For April, technology allows students to “be engaged a hundred percent of the time” and is “great for peer editing,” especially when there are mixed ability groups and students can peer edit the grammar and mistakes of another student before it ever got to her as the teacher. She also

does many labs that include data collection and loves that the online spreadsheet program allows multiple students to edit data at the same time both during and after the lab.

April also believes that technology increases "student engagement" and allows the school "to differentiate better." She likes that technology allows for the use of programs like Notability for the tactile student to be able "to actually use their finger to draw things and to write things and to do visual note-taking." In the past, April said the only way to assess the knowledge level of students with disabilities

> was to have them speak it to you because you knew the block was from here to writing, but that wasn't that they didn't know the science—so just having options like that just to take away that roadblock and they can speak it, to—a lot of them use speech-to-text being able to look up and get reading material at their appropriate Lexile level—I mean, the list could go on and on and on, really.

April also mentioned that many students struggle with organization, and the new technology tools "pretty much a eliminated the fact that they lost the papers all the time." She said the students cannot lose their assignments and work because there is now a copy of that work in the eBackpack program; April calls this a game changer for many students.

Unevenness in how technology was used, disagreements on what constituted good student outcomes using technology, and lack of evidence of deep learning did not dissuade the technology leaders from their beliefs that students benefited from the use of technology. To the technology leaders, these issues were offset by the ability to personalize the technology for students with differing needs and learning styles, by helping students access information and knowledge from around the world, and by helping students manage their daily work assignments.

Professional Development

The Big Valley School District staff offered a variety of professional development opportunities for teachers both in school and out of school throughout the year. A common thread among the technology leaders was that an informal approach connecting teachers with their peers for professional development was one of the most successful methods employed. For example, Marge used a personal approach in getting teachers to use technology:

> One of the things I found out along the way, cause you try, and just like kids, you got to find the teachers interest to snag 'em somehow, and so I used to try and go and help them with their cool projects and add technology to it and that didn't always work, and sometimes it backfired royally, especially if the technology didn't work and it screwed up their favorite project; so then I got looking at it and figured, "Okay—what do you hate doing, what doesn't work well, what's that unit that you have to do in your curriculum that you don't like, the kids don't like, you're all bored out of your sneakers but you got to grind through it—" "What was that?" "Okay, how can we make that better?"

Joan says she has input into what professional development is done for district and has been recipient of the professional development offered by the district. She believes peer-to-peer professional development among teachers is more effective than administrator-to-teacher professional development, and so works with the other technology leaders to "know which staff members are comfortable" and "good with technology" so during workshop days they can have these technology-savvy staff "present at our workshops for other staff members." An example Joan gave was when a "Middle School teacher who was really good with data" help lead "a data workshop for all the other teachers."

Susan asks people to work with others, and also does a shout out at the faculty meeting for volunteers. She encourages peers to present at workshops and share their skills. She also asks teachers to pilot different technologies that she encounters at conferences by first trying something as they currently use it and then trying the same thing with the new technology in order to discern whether the technology is worth using with more people.

Philip develops an informal list of people and their strengths in order to get help to others when needed. He wants a more comprehensive approach with "an evaluation system that gives teachers all they need for putting things together in the classroom." Philip also wants a great plan for professional development, training, and support for teachers and good articulation of the expectations. He wants to celebrate teacher successes and believes teachers are lifelong learners who want to do a good job. Philip believes if you provide the right scenario for the teachers, they will be "less overwhelmed."

April talked about the different professional development opportunities that were offered by the district. There were afternoon training sessions that were held on a variety of topics, such as teacher-focused training on the student information system and Google Classroom. These sessions were targeted for beginner or advanced users at different times. During teacher workshop days, April said, outside trainers were brought in but teacher leaders were also used "because they speak 'teacher' language." April explained" "Sometimes [new technology is] too advanced for the general audience, and people aren't really brave enough to say 'I don't have any idea what you're talking about." Therefore, "we have used a lot of teachers" to introduce devices and explain procedures in teacher-comfortable language. April is able to attend technology workshops outside of the district.

A personal approach to “snagging” teachers, matching up skilled teachers with less skilled teachers, and numerous training opportunities throughout the year were some of the ways that the Big Valley School District technology leaders provided the teaching staff with professional development with using technology. Philip did believe his teaching staff wanted to learn more and so would prefer a more comprehensive approach to teacher support.

Summary

To summarize the situation at Big Valley School District, the technology leaders believe in using technology in support of student learning in a highly practical manner. The administrative leaders—Marge, Joan, Susan, and Philip—value the use of technology in making their jobs easier and more efficient, but also value, along with April the teacher, the technology the students use that imparts the skills the students need to succeed after leaving the district. When making decisions related to technology, Marge, Susan, and Philip prefer to include teachers in the decision-making process; however, budgetary or time-sensitive issues dictate the final decision-making path.

Face-to-face conversations when working with staff and teachers constitute the most common method of communication, and the technology leaders talk with each other regularly and support each other with the technology they use or are learning to use. Regarding the use of technology by students, technology leaders highly value allowing students to personalize technology devices even with evidence of uneven technology use, a lack of good student outcomes using technology, or a lack of evidence of deep learning. Also, a personal approach to snagging teachers, matching up skilled teachers with less skilled teachers, and providing numerous training opportunities throughout the year were the ways the technology leaders in the Big Valley School District encouraged the technology use by staff.

When asked how they perceived their school or district's integration of technology was proceeding relative to other schools or districts in Maine, the answers from Marge, Joan, Susan, Philip, and April were positive but cautionary. The technology leaders generally felt that the school district was "ahead of the curve" in using technology for student learning. However, they worried that the district might be falling behind and not reaching the full potential for the use of technology with teachers and students.

Marge felt that the district was "starting to fall behind the curve" in how it used technology in instruction, saying that "we were ahead of the curve for a number of years and then I think people got complacent, comfortable." She related further that

> [t]he elementary school's where it's taking off right now, K-6. They're doing the most interesting creative [and] innovative stuff of any of them. At the 7-12 level, there are pockets of interesting [work] but a lot of it is just kind of they found their use, they found their niche, and it's just part of the scenery and it's no different really than paper and pencil, chalkboards versus whiteboards, it's just another tool and I think sometimes we're falling behind just because we're not pushing the envelope. And then I go out and look around and realize that yeah, we're doing fine...I'd like to see them doing more project-based, design-based, constructivist-based stuff which would also push that envelope... kind of stepping out of their comfort zone... I don't think we've fallen behind yet, but technology moves so fast, if you don't keep moving, you're falling behind…"

Marge also felt that teachers were not always held accountable for not learning to use technology:

> [S]ometimes, I think we give them too much time, and by that, I mean we don't really hold them accountable to learning and using the technology. There's some people who've

been here for longer than I have who still don't have the basics down in terms of just fundamental productivity tools and communication tools. So, I'd say they've had more than enough time... I'd say they've had plenty of time if they wanted to be bothered whether they were overwhelmed or not—at some point in time you've got to figure it out.

Joan felt that district was, in some aspects, “ahead of the curve” but saw moderate-to-limited use of technology in the classroom. Her observation was that “you can lead a horse to water, but you can't make him drink.”

Susan felt that technology “efforts are ahead of the curve,” but the use of technology “is not where I'd like it to be.” She felt there were some teachers whose integration of technology was falling below their capabilities. Teachers with technical skills who seemingly chose not to extend those skills were “stuck in a mode.” She was unsure if this was due to “instructional stagnation” or caused by “technical resistance.”

Susan would also rather see technology as a classroom tool that does not go home with students. She perceived that allowing students to take their school-provided devices home engendered a sense of entitlement and ownership. She also admitted she was “not being convinced that the majority of our kids use the tools when they go home to do the work.” Students instead could sign out technology to take home for specific assignments—an arrangement she perceived as inefficient but also as a trade-off that would be worth doing.

Philip felt the school was ahead of the curve in the technology provided to staff and students but behind the curve in the product that was produced because of technology. April felt that her school has “been ahead of the curve” but was not fully sure of this, as she had “never been anywhere else.” However, when she went to other schools and was able to see what other schools used for technology, she then felt more confident that “I think we're still ahead of the

curve" and were "definitely not behind the curve." She felt her school's implementation of technology use was "just right."

Together, the views of Marge, Joan, Susan, Philip, and April depict a school district that had a good base of technology to work with, a staff that could be uneven in the use of that technology for student learning, and a real belief that good instruction benefited from the use of technology by students. The leaders believe their district to be either "just right" or "ahead of the curve" in the use of technology for student learning, and even though not all staff and students may be using technology to its fullest potential, technology was now a normal part of the tools that students need for education.

Broad River School District

The second case study site, Broad River School District, lay in a small rural town in Maine with a population of just over 2,340 people (according to the 2010 census). There were a number of businesses in town, both large and small, and no hospital. The public school district had three school sites, with one school serving grades Pre K-2, one school serving grades 3-4, and several buildings serving grades 5-12 on one campus location.

The school district maintained a public Internet web site that listed a technology page listing the names and telephone numbers of the two individuals working with technology in K-12 classrooms. No job titles were given for those individuals.

There was no mention of the technology plan that was required by the State of Maine Department of Education (MDOE) on the technology page at the time of the study, but there was a link to the technology committee page. The technology committee page contained a list of the people who served on the most recent technology committee, and the technology plan was available to view or download as a PDF file at the bottom of the page. The district was up to date

on the technology plan (set to expire in 2019). The technology plan did contain all of the elements required by the MDOE for technology plans at that time. The grade 6-12 school also had a technology page, but that only contained the previous technology plan available for download; the new technology plan was not available as of this writing.

The technology committee, listed as the planning team in the technology plan, was responsible for the creation of the current technology plan. Members of the technology committee included the superintendent of schools, curriculum coordinator, both principals, two teachers, and the two technology technicians from the schools.

The initial contact for the Broad River School District was Steven, the grade 6-12 principal. The organizational chart for the Broad River School District (see Figure 4.2) showed that Steven was positioned in the leadership structure directly under the superintendent and assistant superintendent of schools. The administrative team was further made up of the two other building principals and the special service administrator. There were also two technology technicians supervised by the building principals, there was a business technology teacher, and a library aide in the media center. At the bottom were the teachers, who connected with technology-oriented colleagues and with non-teaching staff and administration.

Snowball sampling (Noy, 2008) was also used as the sampling method in the Broad River School District. As the key informant, Steven was asked whom he would consider to be other technology leaders at Big Valley. Steven listed the technology technician, Chad, the library aide/media center educational technician, Nicole, and the business/technology teacher, Amber, as the technology leaders in the school. Further snowball sampling from Amber led to Melissa,

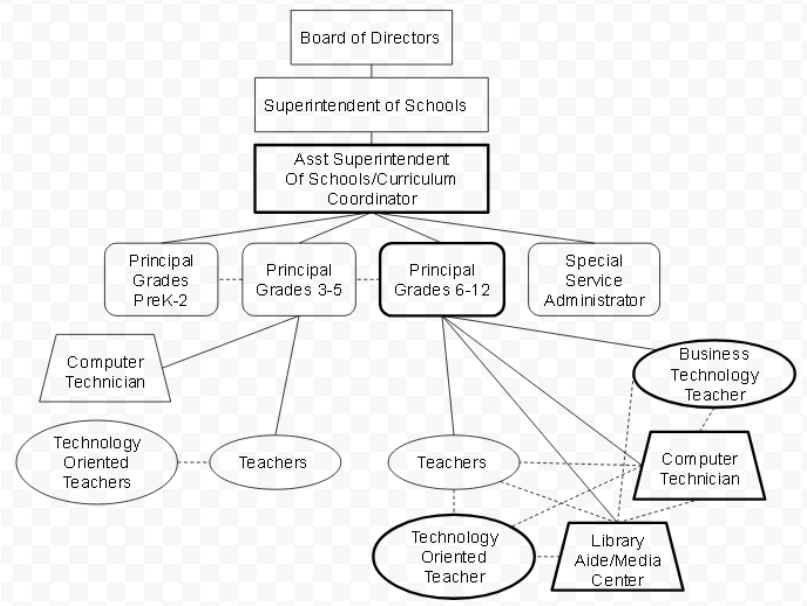

Figure 4.2. Organizational Chart for Broad River School District with formal/informal connections between staff.

another member of the teaching staff, as a technology leader. The assistant superintendent, Jennifer, who also worked as the district curriculum coordinator, was also identified by Steven as the unofficial technology coordinator, as the district did not employ an official technology coordinator, and Jennifer did some of the technology coordinator functions such as chairing the technology committee and preparing the technology budget.

The Roles and Responsibilities of Technology Leaders

In contrast to the school district in the previous case study, the Broad River School District operated without a designated technology director or coordinator. The responsibilities that a coordinator or director would normally do were unofficially done by Jennifer, the assistant superintendent and curriculum coordinator for the district, with Steven, the principal, helping Jennifer. There was a technology committee in place in the district, but according to the technology leaders interviewed, the committee had not met formally for a while.

Steven. Steven was the grade 6 through 12 principal and had been in education for thirteen years, eleven of which were spent with the Broad River School District. Steven was a self-described "tech-centered administrator" and used a laptop, the student information system, a smart phone, an iPad, and a smartwatch daily for his duties. Steven also emailed staff daily and tracked student data using a "dashboard" that he used to track attendance, discipline, and enrollment rates. Regarding the technology budget, Steven started his discussions "at the ground level" with the technology technician, Chad, and with the teachers' budget requests for technology. These budget requests were then discussed with the assistant superintendent, Jennifer, and the superintendent during the budget process. Steven was also involved in the discussion about what technologies were being used in the district—e.g., the discussion on moving from iPads back to MacBook Airs for the students.

Steven also worked with Jennifer on the technology plan, which involved looking at data from the middle school technology survey, and also discussed the budget for the technology items in the plan with her. Steven said there was "loosely" a technology committee, as the committee had not met on a regular basis for a few years but did "use technology to communicate… threads together and we talk [through] forum-based discussions on what our needs are, what directions we're moving in, stuff like that."

Jennifer. Jennifer, the assistant superintendent and curriculum coordinator for the Broad River School district, had been in education for over 26 years and had been an elementary teacher, a literacy specialist for grades K through 8, an assistant principal, and then a special education director prior to becoming the assistant superintendent and curriculum coordinator. As the Broad River School district did not employ a technology coordinator at the district level, Jennifer also performed some of the technology duties such creating the technology budget,

chairing the technology committee, and making sure technology equipment was ordered for the district. She also managed the Title VI grant which was money allocated for the district for technology.

Chad. The technology technician for the grade 6-12 level, who called himself a network administrator, was Chad. Chad been in education for over 12 years as a technician but had begun his career in the software industry before switching over to education. He primarily used a laptop daily and sometimes used an iPad Mini in troubleshooting.

Chad's job was to help maintain the school network and equipment and help both students and staff with "troubleshooting" technology issues. Not having a background in technology or teaching, Chad helped minimally with integration efforts and described himself as not being one to "go and try to see what everything does... like, what can you do with this." However, if a teacher needed help with "something they are trying to do," he would "try to figure it out for them." Chad was listed as a member of the technology committee and was involved in prior decisions on what type of technology was used by students in the classroom.

Nicole. The Library Aide/Media Center educational technician was Nicole. Nicole had been in education for six years as the school's library aide. Nicole used her laptop daily and also used different technology devices related to her job as a media specialist, such as iPads and video and music editing equipment. During the school day, Nicole often helped Chad, saying that "if somebody needs something set up or something's not working right and Chad isn't available, they'll come to me." Nicole considered herself Chad's "right-hand man" who did "all of the things he doesn't want to." Nicole was listed as a member of the technology committee and was involved with the decision for the school to adopt iPads a few years previously.

Amber. Amber was the business and technology teacher and had been in education over 20 years. Amber used technology every day in class, using a PC-based computer lab and both iPads and a laptop for organizing student work. Amber used Google Apps for Education with the students, utilizing Google Drive spreadsheets and even Google Hangout. She also used Photoshop and InDesign on personal computers and iMovie with the iPad because the students had iPads. Amber kept track of the budget and supplies for toner for the copiers and the printers in the school but mentioned being frustrated by having a broken laminator and a broken color large-format printer and so did not "need to order supplies for those." Amber was listed on the district web site as being on the technology committee and was also listed in the last two technology plans as being on the technology committee. However, during the interview, Amber said she was not a member of the technology committee and that "there's supposed to be a technology committee and a tech plan."

Melissa. Melissa, the grade 7 and 8 teacher, had been in education over 11 years and used iPad Mini and laptop every day in class for teaching and grading. Homework assignments and tests were kept electronically in Google Classroom. She liked to use a projector and document camera when teaching the students, but she and the projector were not "getting along right now," so she had to use her standard whiteboard instead. Melissa was not a member of the technology committee at the time of the interview and had not been on the committee previously.

The technology leadership responsibilities in the Broad River School District, as outlined here, were mainly covered by the principal, Steven, and the assistant superintendent, Jennifer. Chad, the technology technician, and Nicole, the library Educational Technician, worked together in handling the day-to-day operation of the network and devices, including troubleshooting issues with staff and students. Amber, the business technology teacher, focused

her efforts on the technology in her classroom, working with students on both Windows desktops and Apple iPads; Melissa used the Apple iPads exclusively in her classroom.

Beliefs in the Value of Technology

The technology leaders in the Broad River School District utilized technology every day and believed the technology they used had value in making their jobs easier both by facilitating communication with staff and students and in organizing their professional work. However, there was not a unanimous opinion on the technologies that were valued. A few of the technology leaders believed that some of the devices being used in the district were underutilized by both teachers and students. There was also a difference in the beliefs in the value of technology used at work versus the technology that was used at home.

To Steven, technology is "multiple things." He considers himself "a tech-centered administrator" who believes technology is "an important piece to learn especially when how we're progressing as a society, you know, jobs and how we communicate and all that." However, his background in sociology leads him to see how technology is "degrading us" even while "advancing us," which gives him a "push–pull" or a "love–hate relationship" with technology. Since Steven uses technology every day for his job as principal, he also feels the push–pull relationship with technology:

> Someone asked me the other day what's my greatest strength and downfall—I said my greatest strength is technology, [and] my greatest downfall is technology, because with that I've made myself so accessible... on me constantly is either my MacBook, my iPad, my iPhone, or my iWatch... so everywhere I go, I'm centered with technology.

At home, Steven uses technology in many different ways. Being a cyclist, he uses a GPS device that maps "everything from my bio break down to heart rates and calories and... where

I'm going and distance and average speeds." He watches streaming video using an Apple TV and a Smart TV. He even purchased a wireless thermostat that could be monitored and changed using his smartphone. He and his wife synchronize their calendars using an online calendar program. Concerning his use of technology, Steven believes that the "value of setting all this up" is that it will "decrease my overall time in the long run" and believes technology helps him in his "constant quest for simplicity."

Jennifer sees technology "as a tool to help the students get at the academic learning" for reaching mastery but considers it "just one way" that students can show mastery. She related a story about how sometimes there was inconsistency in how technology was viewed as a tool:

> One of my favorite stories is that my niece was heading off to a tour trip for a weekend. She was at the school where they were one-to-one and, you know, they were really touting the iPad as the tool and... they were going paperless, and so she got ready to go on the trip and the principal said, "Oh, you can't take your iPad," and I said to my sister "So would you tell a student they couldn't take their pen or their pencil?" I mean that just didn't make any sense to me at all.

Jennifer uses an iPhone, an iPad Pro, and a MacBook Pro daily, using them "constantly." These devices help her to "communicate with staff," helping to "push things out" but also allowing her to work with staff on the curriculum using an online document sharing program. This allows her staff to "be in different places working on the curriculum" while also giving Jennifer "immediate access" to the changes people are making in real time. At home, Jennifer brings her work devices home and does "a lot of stuff from home" but also uses this technology to stay "in touch with my boys, who now do not live with us anymore." Her family uses streaming technology to watch movies, and the camera functions to take pictures.

Chad said that technology can “mean a lot of things,” such as manufacturing, home security, or any device that people use. Daily, he uses an MLTI-issued laptop that connects to his school’s Wi-Fi network, and uses his personal cell phone at work for communicating with the principal and staff. He also uses an iPad for troubleshooting student technology issues and not much else. At home, Chad owns an older-generation MacBook laptop of the model that was once used in the MLTI program; he uses it for Internet browsing but explains that he does not “spend much time” on the laptop at home as he gets “enough technology during the day, I guess.” He said, “If you told me I couldn't have my [home] computer, well, I say, I wouldn't need it.” However, Chad later said that he used his home computer for doing online banking, communicating, and looking up “stuff” on the Internet. He admits that, “yeah, I'd be lost without it, probably, because I do know [that I am when] the Internet goes down.”

Concerning the value of the technology in his school, Chad says that “the value would depend on how it should be used.” He does not feel that the technology is being “used to its potential” and said that “the value of it, as it is right now, is not great.” If teachers were to use the technology more with students, he said, “it would be wonderful,” and then the technology “would provide a lot of value.” Chad said that the teaching staff “should stop pretending that they're using technology” and just “teach the old way, or something.” He believes that the school administration “went one-to-one with everybody to say we went one-to-one,” but, in reality, there are “just a handful of teachers that use” technology, adding that there were classrooms “I never go in for a technology issue because they're not using it.”

For Nicole, technology has “a lot of meanings, actually,” and so she believes everyone thinks of technology as computerized technology. Nicole said that to her, technology consists of “new and upcoming” items that had not been “thought of before” or is “new ways of doing

things and new ideas." She uses many devices in the library, including a desktop computer for the circulation program, a laptop that she can "obviously carry with me to multiple places," and an iPad. The iPad, however, is not a favorite device of hers:

> The school did provide me with the iPad as well [but] I don't work off the iPad. I personally, especially doing this, I never would have realized it, but iPads are really driven to be a personal device working in the school, and trying to multi-manage an iPad is almost impossible—so that's something that I found... I had the iPad so that I could learn programs so I can teach the students.

Nicole uses a variety of other technologies found in a library, such as a fax machine and photocopier, but is also starting to do 3-D printing using a Makerspace printer. She also uses a desktop computer that is used for creating digital media, has a drawing pad available for creating animations, and has video editing equipment and music editing equipment available for use. Nicole said that the value of the technology to her is "huge," as it helps "prepare our kids to know how to use [technology] when they leave here." She believes that technology makes everyone's "jobs easier and more streamlined."

Amber, the business teacher, believes that technology is "a lot of things really, but to me it's more with computers, of course, because that's what I teach." She feels that technology is "always changing," so there are always things to learn in order to keep ahead of the students; she said the students were "very versatile with all the things that they do" and often teach her new things. In her classroom, Amber uses Windows-based personal computers with software packages such as Photoshop, InDesign, and Illustrator. She and the students use the computers and software to do a "lot of publishing for the community and the school." Amber uses Google Apps for Education daily along with the students and uses Google Drive for "everything." Her

class uses iMovie with the iPad because “the kids have iPads until next year,” but she finds the news that the school is “getting laptops” in the next school year “exciting,” because she feels there is more she and her students can do with the laptop versus the iPad. Amber says the technology she and her students use is

> extremely valuable... I think it's great that we know how to use all of those items in the technology, especially working with kids; if I didn't know a little bit about all that stuff, I think I'd be not a very good teacher for one thing.

At home, Amber uses a Windows-based personal computer but also uses a tablet, the school’s laptop, and a Kindle. She uses a smartphone at home as well, especially the calendar application.

Melissa, the grade 7 and grade 8 teacher, believes that “technology’s a lot of stuff,” including computers, tablets, smartphones, but also says that “for some kids technology is as simple as a pencil sharpener when they've never come in contact with electric pencil sharpener.” She considers technology “the stuff that makes our life easier... on a day-to-day basis.” She says that her “iPad Mini... is my best friend” and that she literally carries “it around my classroom,” where she uses an online form that she created in order to “just tap on” the student’s name to record “if they've done their homework.” For Melissa, this online record means “there is no question at that point” that the homework has been turned in, and even if the papers are not corrected right away, she knows the homework was turned in on time. Melissa also uses Google Classroom with all of her reading and writing classes; this “eliminates the paper flow” and makes it so her “school bag doesn't weigh more than I do” when she goes home at night, since she does not have to carry the student’s papers with her anymore—“it's all electronic at this point.”

Melissa also uses applications that help her communicate “daily with most parents.” Melissa believes technology is “more valuable in the classroom” than it is to her at home. Technology keeps her organized for school so she does not “have to stress over that,” and does not miss carrying a three-ring binder “back and forth all the time” because “it's electronic now.”

When considered as a whole, the technology leaders’ beliefs in the value of technology were positive when considered for the work environment even though not every device was similarly valued. Steven, Jennifer, and Melissa all valued the use of the iPad for doing their daily work, while Chad, Nicole, and Amber preferred their laptops. The value of the use of these technologies at home appeared to depend upon the usefulness of the device for keeping up with work-related items after hours.

The Making of Technology Decisions

There was a lack of agreement among the technology leaders in the Broad River School District about how decisions were made regarding technology matters. The decision that was foremost in their minds during the interviews highlights that disagreement, which was the decision to go from iPads back to laptops in the district. Steven and Jennifer related a much different picture of decision-making than Chad, Nicole, Amber, and Melissa did.

When asked what process was followed in deciding on the technology that students use, Steven said there was the “formation of the committee, a tech-based committee,” which did some baseline surveys of what teachers would like students to use; however, he said “to be honest, a lot of it was just kind of like, ‘What's the latest and greatest coming out and let's get it in our kids’ hands!’” There was also data collected in the form of an electronic survey from the students that factored into the decision to go with iPads.

In making decisions related to technology, Jennifer strives to work collaboratively with staff in making a decision. She endeavors to bring teachers into the process and allow teacher input into the change being discussed, hopefully resulting in a decision. However, sometimes circumstances make the decision for the district, as in the case of the switch from the iPads back to the MacBook Air: the teachers were "pretty vocal about their dissatisfaction with the iPads" which drove the decision to go back to the MacBook Air.

Concerning the decision-making process, Chad started to say, "Yeah, there's no…" but instead of finishing that sentence told a story about how he got a call from the central office a few years ago that said, "They're delivering 13 copiers; you need to make room for them." Chad responded, "What are you talking about?" He had been not involved in any of the discussions. Chad was surprised by the announcement: "We weren't in on anything, like will they run, will the Macs print to them" or other such practical matters. Chad thought a decision concerning copiers was being made again, as he said, "I don't know if they're upgrading them again; they've talked about it," but "I'm not in on any decision really—at all."

Chad also told of another decision that was made by the central office: the decision to go with iPads. Chad "wasn't in" on any of the meetings where the decision was discussed on whether to go with iPads or MacBook Airs, and he felt that the decision was made primarily due to budgetary constraints, with the staff being told "This is what you're going to get." He believes the students and teachers do not embrace the iPads, and said he heard the students say, "I hate this thing, can we have the laptop back?" In the current refresh of the MLTI program, Chad saw that the price for the laptops was now lower than before and so "begged the principal to please fight for getting the laptops back because the teachers hate them, the kids hate them, and I'd like to see them used." He feels that he did convince Jennifer to go back to the laptops, but was not

sure if that has any effect as “you see, I'm not in on any meeting at all.” Chad said the technology committee had not met for two years and that, at the time of the interview, they had “not sat down and talked about technology as a group” since then.

Nicole said she does not “know beforehand” how technology decisions are made but said she did not “believe past administration really has a good understanding on what the iPads were and what we could do; we have found it very frustrating to try to work with iPads in school.” She said she was told “the iPad was what was... new and up and coming; that’s what they wanted us to get.” On the switch back to laptops this year, Nicole said the decision “was discussed between the principal, myself, and the technology technician, and some others,” and was “sure they talked to some other people” as well. She said a survey was done with the teachers on how the technology was used and what was liked and disliked, and the determination was made to go back to laptops. Of this, Nicole said, “So next year we're going to have laptops again—yay!”

Nicole said she thought the decision to switch from the iPad back to the laptop was made “during April break,” when the committee was not convened, which was why she, as a member of the technology committee, was not involved. She believes the district administration had to “make an executive decision” but thought they made the “right one, so I don't mind that.”

When Amber was asked what process was used in determining the technology being used by the school, she said, “Teachers were not asked [and I] don't know who made the decision. I'm assuming [the] superintendent made [it].” At the time of the interview, Amber said that “there's supposed to be a technology committee and a tech plan,” but it “ran out or was ready to run out.” She has said to Chad, “You know, we really should talk to the superintendent, this [the technology plan] needs to be updated.” She said that Chad got in touch with Jennifer and said, “You need to do something,” and that Jennifer “updated it, I guess.” She felt that “nobody has

any input" and said that "there's no tech director, there's nobody in charge of technology—we're just winging it, which is kind of sad."

Melissa was not a member of the technology committee and usually went through Steven with her ideas on how the school should be using technology in the classroom. She did not know who had made the decision concerning replacing iPads with laptops and felt that the teachers "weren't given any input." She added, "I don't recall having any input." Melissa was provided the opportunity to attend a technology conference but admitted the professional development for technology has "been trial and error," and "some of us who are more into technology do far more experimenting and sharing of ideas than others." She did feel she was given good support from Chad, who was "here whenever we need[ed] him." Steven was also good for support, such as when he helped troubleshoot support for the state testing software in a previous year.

As shown above, Melissa, Amber, Nicole, and Chad all told a different story than Steven and Jennifer concerning how decisions were made related to technology. The move away from iPads to laptops is an example. The staff views on use of iPads versus use of laptops were heard with the decision being made apparently during a vacation week; however, except for Steven and Jennifer, the technology leaders were not aware of who made the final decision.

Communications with Staff

Conversations about technology in the Broad River School District covered managerial activities—e.g., Chad talking with Nicole about device issues or Steven talking with staff about the school website—and also covered pedagogy related issues such as discussing the results of a survey on technology use done by Jennifer. As it will be shown below, many discussions were horizontal in nature, taking place among peers, rather than vertical in nature.

Steven, as the principal, is “always talking with my professionals” about technology, and also mentioned talking with Chad about moving a grade level into the school to make sure there “was coverage” for the additional devices. Steven also talks with Chad about the choice of “devices moving forward,” telling Chad that “okay, so we going to buy back in and we're doing this, and we want to go MacBook, so what does that mean?” He also talks to the teaching staff about those changes and spends time prepping the staff for the changeover to new laptops, including how to transfer files from their old device to their new device. He also talked with his music teacher about building audio files for his students to track student performance over the year. These discussions with staff happen “quite literally everywhere” and were “integrated in most of my conversations in some way.”

Steven also mentioned that “one of the things that we needed to do better with our school is communicate with our communities.” He further discussed community outreach using social media sites. He also talked about overhauling the school’s website to make it “more user-friendly to the point where you can go on our faculty page click on a staff members picture and email them directly.” He said the school created portals for parents and students in the student information system so students and parents could login anytime. The school also sent out an e-newsletter every month and began distributing report cards in electronic format, which ended up saving many days’ work for the office staff.

Jennifer is “always checking in with” her technology people in the district but also converses with the administrative team on technology matters, such as discussing the surprising results of a survey on technology that she has recently completed. She also says that Steven frequently asks her “Can we do this?” regarding something new in technology that he wants to

do. Jennifer said there is a formal technology committee that has met in the past to talk about technology matters, but in the past year-and-a-half the committee had “met hardly at all.”

The conversations Jennifer has about technology can “certainly be [held] anywhere” but mostly happen during her team meetings, both with vertical teams and grade-level teams. However, she also gets “hit up” with technology questions in the hallway and has teachers invite her into their classrooms, saying, “Hey, you know, I'm doing this really cool part of my unit and it incorporates this piece of technology, would you like to come in and see it?” She considers that part of her job “very cool.”

Chad talks mostly with staff about work-related technology issues but also talks with students about their personal devices at school when the devices are not working. These conversations happen in his office, in the classroom, and in the hallways. Since the principal is “pretty tech savvy” and tries “his best to figure anything out,” Chad said that Steven “doesn't ask me a whole lot.” Thus, Chad does mostly “busy work” and “get prices on stuff” for the principal. Chad only converses with the assistant principal about the security camera system, as the assistant principal “couldn't care less if he had technology” but “didn’t “know how to” check the cameras himself and so needed Chad’s help.

Nicole often talks with Steven and Chad about technology and bounces “a lot off each other” in the process. She also works with Chad if there is a “need to go further” and get outside help with questions or issues. These conversations happen face-to-face, through email, and sometimes though Facebook chat.

Amber talks to students and teachers about technology daily. Amber is a member of a Tech Club that meets Monday after school. The Tech Club is for community members, staff, and students who need help, and Amber believed the club has helped “quite a few.” She also emails

teachers about technology, meets regularly with teachers during her prep time, and meets staff in the hallways, usually with a, “Hey, can you help me with this, or can you help me with that—I'm kind of the go-to person for that.” She also talks with Steven about technology, but “no higher than that” in the leadership hierarchy.

Melissa works often with Chad and considers him her “superhero.” If she runs “into problems and glitches with Google-based things” she calls Amber. She also talks with Steven, as when she needed Steven’s help in finding a way for her to keep her iPad Mini after the switch from iPads to laptops. These three individuals are her “go-to people.” The conversations she has about technology happen by phone or by visits, and with Steven the “conversation is actually via email.” She thinks that Steven is “the first one we've had that’s really been into technology to the point where you can have those conversations; previous administrators were like, ‘I don't know what you're talking about—go see Chad.’” According to Melissa, Steven understands “how important [technology] is in the classroom.”

Together, the observations of the technology leaders about their communication habits indicate that, similar to those of the leaders in the Big Valley School District, the technology leaders use informal, face-to-face conversations when working with staff and teachers about technology items. Many of the conversations happened horizontally among the technology leaders, such as the conversations among Chad, Nicole, and Amber about technology issues among staff and students, while Steven and Jennifer talked about technology items between themselves and the administrative team.

Beliefs About Student Use of Technology

The following paragraphs highlight the beliefs of the technology leaders concerning the value of technology for use by students. The value of the technology differed somewhat, with

Chad being the technology leader who mentioned the misuse of the technology and Amber being the technology leader who believed her desktop computers were more effective than the iPads. However, Steven, Jennifer, Nicole, and Melissa all believed in the value of all of the devices in use in the school.

Steven said with his school having one-to-one devices for the students, with the iPads and then "going back to MacBooks" the next year, he is really pushing his staff to integrate technology into learning. "I mean, if we're going to produce 21st Century Learners," he said, "we have to do that." However, he noted that the focus had shifted from integration and more toward "Common Sense Media things," as he sees a need to show the kids "how to use technology... better than we do now." He says it is "a matter of protecting them" because they are using the technology "inappropriately" more than they are using it "to be productive."

Steven is also "pushing the kids to get away from the iPad as... a gaming piece" at the middle school level, as the students at that level "look at tablet-based things as, oh, I can just play on this." Thus, Steven hopes that moving to MacBooks in the next school year will reinforce the awareness that the technology is "not a gaming device." In contrast, Steven believes there is more going at the high school level with students and technology, and those students are using technology more appropriately than middle school students are.

Steven also believes that the use of technology has upsides and downsides. On the upside, he mentioned a conversation he had with a former student who was now at a prestigious university. This student said that he had moved "far and above" his peers when using forum and thread-based discussions and electronic submissions because of the way he was pushed to manage his learning through electronic means in school. Another example of an upside to technology Steven discussed was the use of the on-line Plato system. This system offered four

advanced placement classes that provided students with “a real-world application to continuing their learning.” He thought it was a “strong thing that we're doing” and considered it “kid-centric learning.”

On the downside of technology use, Steven told a story of “technology biting us in the rear end.” A student, who was checking grades through the student portal of their student information system, was “smart enough to go in and calculate the fact that they can bomb their final, and not even attend their final, and still pass the class.” Steven was of two opinions on this matter. One opinion was that he should say to the student, “Awesome that you figured that out; I'm really happy that you're that in tune into what's going on, you know, you used ample Math in real life situations—high five to you!” The other opinion Steven had on the situation was that he should say “Really? Like the amount of energy you just expelled into figuring this out you could put into taking your final and you never know you might get a better grade.” However, even with behavior such as this, Steven felt that staff had “noticed kids more on top of their grades” with the access through the student portal, so he felt it was still a good thing for students to have the access.

Additionally, Steven’s beliefs about the student use of technology are “very much student-driven,” as over time he has seen students in school become “advocates for [the] integration of technology” beyond the teachers’ expectations. As the “seasoned staff had graduated on,” he was seeing “tech-centric” teachers coming out of the university who already had a technology mindset; therefore, he now saw a better match between what the students expect to see and what the teacher actually does with technology in the classroom.

Finally, Steven’s beliefs about technology are also influenced by what he has heard from outside of school and even outside the district. Area businesses are looking for people with

specific technology skills and are not finding them; thus, they are hoping the school district can help with that shortage. Colleges and the military are looking for students with technology skills, leading Steven to wonder how to "prepare them or expose them to technology" more than the school has done already. Steven believes that the school needs to continue to apply "those real-world topics" to education in order to "expose our kids to them." In his own words, the "real world is... driving what I do."

Jennifer sees the district using a mix of iPads, Chromebooks, MacBook Airs, and interactive whiteboards. She said the district would be switching the upper grades from iPads to MacBook Airs in the next school year. She believes that technology is being used more in elementary classrooms then it is in the middle and high school classrooms. She believes the lack of use of technology at the upper grades results from the lack of "time for the content...they're feeling the crunch with the standards." She thought the percentage of students who use technology for research and answering questions is actually higher than seen in a recent survey on technology, to which Jennifer remarked, "Just because you have one-to-one and just because you've done some training does not mean that you've done enough to really help teachers kind of embrace [technology], I think. You know, from the survey, it seemed like all the teachers agreed that technology is a great thing. I think we need more maybe specialized professional development to really focus on what individual teachers, that's kind of what I wrote in my plan, need to be able to move forward with students." She believes that "we have some work [to do] there."

Jennifer also believes that the interactive whiteboards and laptops in use in the district allow students to be able to get online and teachers to be able to push out content in different ways, thereby reaching students with different modalities of learning in order to reach different

types of learners than by “just lecturing.” She also said that technology allows students to explore things that they are interested in, which she believes heightens student learning opportunities.

Chad has only “poked around in and looked at” the technology being used by the students, and admitted he is not one to dig into new technology and ask “This is neat—what can it do?” Most of his work involves learning a specific technology to help with troubleshooting. Chad’s views on the lack of effective use of the iPad as a technology device for students is based on what he saw on the iPads when he was troubleshooting them: “If I ever pick one up, nine times, probably ninety-nine times out of a hundred it'll have YouTube open, I'll tell you that.” He also, however, sees evidence of Google Classroom, Google Slides, and Keynote on students’ iPad screens.

Chad believes that the “value [of technology to enhance student learning] as it sits is not very great, but the potential is awesome.” He believes it was “a string of principals that haven't pushed the professional development part” that has limited the potential of the technology to help students learn most effectively using technology. Even when Chad mentioned that the district could have professional development “for free” as it was “a part of the deal” was not acted on; to him it was “in one ear and out the other” with the administration.

Nicole sees the students using their iPads every day and also sees teachers using Google Classroom, Drive, Documents, and email. She said the school tries to encourage students “to use Google as much as possible” because it is easy to use, and the students can draw from those skills outside of school. Nicole believes that teaching the students technology is “preparation for the future.” She believes that there are “many occupations when you leave here” that “have to use some technology, even if they're going to go drive a truck,” and that to work in industry the

students need some basic knowledge of technology. These views are influenced by her own experience and by talking with students of friends who have graduated and have become her friends.

Amber does not “necessarily use the iPads in class” because she has desktop computers that are “bigger” and “easier” for students “to maneuver around.” However, her class does do some things with the iPads, mostly with iMovie and Art Studio and by uploading pictures to the student’s e-portfolios. Amber is “not a big iPad fan” and said “I think... most of the staff are going to be very happy with laptops back again next year,” as the general perception is that “there's so much more they can do with” the laptops. Her own beliefs about moving back to laptops were also influenced by her experience with the iPads in her classroom. Amber thought that going from the laptop to the iPad was “going to be really cool” and “great,” but the “work around to do some things that we've always done” ended up being a struggle as the teachers kept asking Amber “How do I do this now and how am I going to get around doing that?”

Melissa used her projector, but at the time of the interview she and the projector were not “getting along right now.” However, she said that “when it’s working it's a fantastic tool.” There was a piece of equipment that Melissa discouraged the students from using—the printer. Melissa said she has taken her “printer completely offline; they cannot access it.” Instead, she prints something for the students “if there's something they really need printed.” The reason she discourages printing is that she believes her students need to “jump to the twenty-first century,” as well as that she does not want to carry home “a zillion pages of stuff” every night.

Melissa believes the value of the technology in her classroom is that it takes “away the excuses” from the students. Even if the student does not have Internet access at home, Melissa says the “expectation is you turn it in electronically; they can take a picture of what they've

done, upload it, attach it to the assignment, and turn it right in." Sometimes, if the student needs to turn in a notebook assignment but still needs the notebook for another assignment, Melissa will "pull out my iPad" and take a picture of the homework assignment, saying "Okay, I have your homework now—you take your notebook and go." To her it just takes "the debate away."

Melissa also said that "if they were going to tell me tomorrow that they were going to take all technology away, I would say okay, but you've got two weeks and I need to have it back again." She feels that the students sometimes take the technology for granted and believes that sometimes the students need "an eye-opener" in order to appreciate what they have. She said if she "could put [the iPads] in my cabinet and lock it, for even two days, I think they would appreciate it... and start working again." Melissa does see a downside to the technology used by the students in that it fosters a lack of attention to punctuation and grammar. Because of spell checking, the students are "losing their grammar, they're losing their punctuation, their capital letters; that stuff is really showing up in their writing."

Melissa sees technology helping the students manage their work, as "they aren't able to lose their work because it's there... they aren't carrying home a heavy textbook." She believes that technology helps the student organize their work and time with the use of the Google Classroom application. These beliefs came from her personal experience observing students in her classroom. She said that "kids that couldn't hang onto a pencil to save their life will have their iPad; kids that couldn't hang onto a notebook have their iPad."

To the technology leaders in the Broad River School District, the technology being used by the students was valued owing to the skills the students would gain for use outside of school, in how it helped students keep track of their work, and for the personalization the devices offered for the different student learning modalities. The technology leaders who identified drawbacks

were Chad, who saw evidence of misuse of the devices, and Jennifer, who saw evidence that the lower grades were using technology in deeper ways (i.e., beyond doing word processing and PowerPoints) than the upper grades were.

Summary

In summary, the Broad River School District's technology leaders showed a variety of beliefs and values related to the different technologies being used in the district. Steven, Jennifer, and Melissa all valued the iPads, whereas Chad, Nicole, and Amber preferred the laptops. This variety of views extended into the decision-making regarding technology matters, with Melissa, Amber, Nicole, and Chad all telling a different story than Steven and Jennifer about how decisions were made. Steven and Jennifer talked of committees being held and staff input being solicited. Melissa, Amber, Nicole, and Chad, by contrast, said no committees met and that staff input was not asked for. Communication patterns followed a similar breakdown: Many of the conversations appeared to be happening horizontally among the technology leaders, with Chad, Nicole, and Amber communicating with each other on technology issues while Steven and Jennifer talked with each other and the administrative team about technology matters. However, all of the technology leaders in the Broad River School District valued the technology skills the students gain that will be useful outside of school, and valued the personalization offered by the devices offered for students with different learning modalities. A few drawbacks were brought up, with Chad seeing evidence of misuse of the devices and Jennifer evidence of that the lower grades were under-utilizing the technology.

When asked how they felt their school or district was doing related to other schools or districts in Maine, the technology leaders gave a mixed review on how their school district measured up. In some ways, they said, the district was "ahead of the curve" in using technology

for student learning; in other ways, however, the district was not reaching the full potential for the use of technology with teachers and students. Steven said that his school's efforts in integrating technology were "kind of ahead of the curve" and cited two examples of why he thought this was the case. One example was that not only were students in his school going to a conference on technology; they were teaching sessions "as opposed to just attending." Additionally, the senior portfolios were required to have an "electronic concept" beyond a mere PowerPoint presentation; the students had to come up with a creative way of presenting their portfolio using other electronic means, such as video. However, the principal was not going to "be ignorant to the fact" that some students still looked upon a device such as the iPad and said, "I ain't using this, this is stupid." He hoped to continue to reach those students by bringing in people from outside of the school to continue to show the students that the technology skills being taught were important to learn.

Jennifer believed the school district was behind in implementing technology use when she started in the district and said that "we continue to...still drag behind a little bit." She said the school district has "made strides" and was moving in the right direction; however, she did not think teachers were using technology as efficiently and as well as they could be. This belief was reinforced by a survey on technology use that she had just reviewed the prior evening.

Chad's thoughts on the school district's efforts on technology were that some technology leaders were not soliciting "any feedback on... what is working or what isn't working." He did not "even see the assistant superintendent" to say "hi," and thought that "she's pretty much the one that you [would want to have] talk to you about technology." Normally, however, "if you need something, she will try to make it happen."

Nicole, meanwhile, thought that “for a small school... I think we're a little bit ahead of the curve,” Of the school’s efforts in providing the latest technology, she said, “We try really hard to keep up and do as much as possible with technology.” She then added that “we don't have a lot of money to spend but we try to spend it wisely.”

Amber believes the school district’s efforts in integrating technology were “a mixture of both” behind and ahead of the curve. She felt they were “fortunate to be one-to-one 6 through 12,” which was “great,” as not all schools were doing so in the state. But concerning professional development for teachers to expand their knowledge of how to integrate the technology into the classroom, “there's none of that and I think that's why the iPads were not utilized more than what they could have been.” She related:

> We didn't have that support and usually when there is that opportunity for support it's me speaking at a staff meeting for a few minutes after I have been to a conference and what did you learn, what can you bring back and teach? I'm often sending emails out and we have a technology group folder, so hey, check out this link... it's a cool thing you could do in this class for that... But then it takes time for that teacher, you know, to look at the link and really see what to do and how could they implement it and I think professional development would be better, a better use of that then just sending an email of things, I mean I reach out to some people but... they're so busy that they've got enough on their plate meeting all the requirements in the state PGP and all that stuff so—there's just one more thing to stop and look at, you know what I mean.

Melissa said the district’s technology efforts depended on the “individual teachers” and that “we have some that are so far behind the 8-ball, they really need to catch up.” She also thought there

were some teachers who were “far more advanced” because they were “willing to take the risks.” She said, “I wish there were more people using it.”

Grand View School District

The third case study site, the Grand View School District, was made up of several small towns, with the two larger towns having a combined population of just over 8,000 people (according to the 2010 census). There are number of businesses in town, both large and small, with a hospital available in a neighboring town. The public school district has two school sites, with one school serving grades K-4 and one school serving grades 5-8. Students in grades 9-12 attend an area high school.

The school district maintained a public Internet website, and on that website there was a link to the technology plan for the district. There was no other technology web page besides the link to the technology plan. The district was up-to-date on the technology plan. The current plan expired in 2019. The technology plan contained all of the elements required by the MDOE for technology plans at that time. The authors of the technology plan were listed as the technology coordinator for the district, the technology coordinator for the area high school, and the administrators of the district and area high school. None of the administrator names was listed. There was no indication of a district technology committee on the website or in the technology plan.

The initial contact for the Grand View School District was Angela, the grade 5-8 principal. The organizational chart for the Grand View School District, (see Figure 4.3) showed

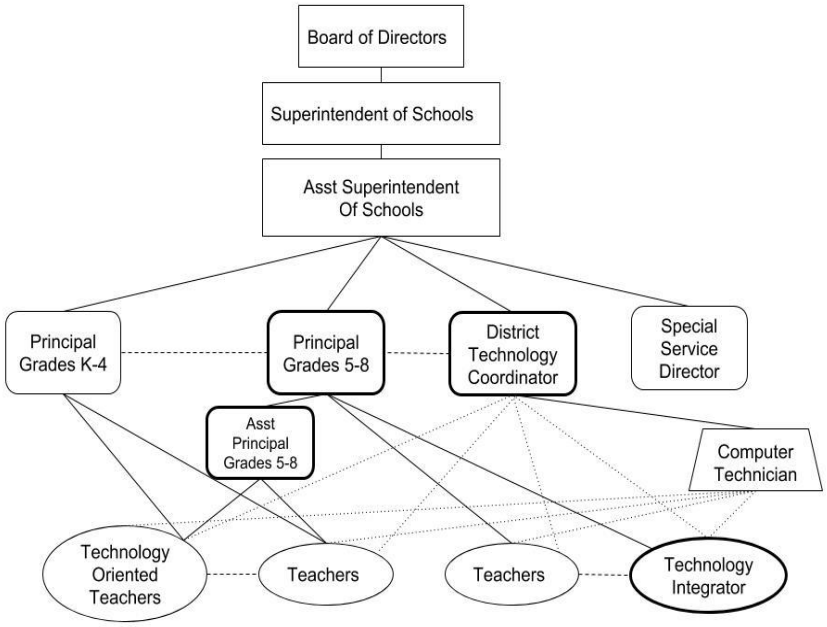

Figure 4.3. Organizational Chart for Grand View School District with formal/informal connections between staff.

that Angela was positioned in the leadership structure as being directly supervised by the assistant superintendent of schools. The administrative team was also made up of K-4 grade level principal, the technology coordinator, and the special service director. There was one technology technician supervised by the technology coordinator and there was technology integrator teacher. Finally, there was an assistant principal and teachers. Snowball sampling (Noy, 2008) was used as the sampling method in the Grand View School District. The key informant was Angela, who provided the initial list of the technology leaders in the district. Angela listed the technology coordinator, Jeffrey, the technology integrator, Robert, and the assistant principal, Rodney.

The Roles and Responsibilities of Technology Leaders

Unlike the two districts in the previous cases, the Grand View School District was a grade K-8 school district. Thus, the responsibilities of the technology leaders were focused on

the technology used in grades K-8. The technology coordinator and technology integrator met monthly with the technology personnel at the high school in order to be aware of what the students were doing at the high school with technology. Sometimes Angela, the principal, would join those meetings.

Angela. Angela was the K-8 principal and had been in education for eighteen years; she taught for seven of those years and was involved in an expeditionary learning program for the remaining years. Her technology duties were to work with and confirm the recommendations of the technology committee and technology coordinators, allocate the desired amount of money in the school technology budget, and defend the budget to the school board. Angela also ensured professional development was funded in the budget but did say that professional development for technology "hasn't happened as frequently as I think we need it to." Angela talked about doing "instructional visioning kind of work" as part of her duties but felt that she was not a part of the visioning process for technology at the school. She said, "It's interesting… I've been saying for two years, [I'm] not sure why I'm not serving on the tech committee... you're writing a plan about instructional technology... the vision should be coming from the principal, but it's really not."

Jeffrey. Jeffrey, the technology coordinator for the district, started out as a teacher and worked his way into the technology coordinator job. He had been in education for 10 years. Jeffrey was mobile and used an iPhone and an iPad daily; he also used a laptop on his desk. Jeffrey considered a large part of his job to be communication, so he spent time sending "a lot of emails" and also wrote up documentation, sometimes in video form, to help other staff use technology. Jeffrey found that he spent "most of my day on my feet" and felt it was rare when he sat at his desk. When he was sitting down, he was usually drafting emails to other staff. Jeffrey

did not have any classroom responsibilities, and spent his day “working with the hardware, working with the administrators, [and] working with teachers.” Occasionally he would substitute for the technology integrator, Robert, if needed.

Concerning the budget, Jeffrey said “the way the budget works was there was no budget.” His meaning behind that statement was that even though he was the “highest sort of... official in the district as far as technology was concerned,” he was “not an administrator”; therefore, the technology budget needed to be vetted by administrators before submission. Jeffrey began the process of building the budget by thinking “about the whole thing strategically,” an example being the decision to stay with iPads for the coming school year or move to MacBooks. Jeffrey then went to the principals to get “buy-in” before the budget was presented to the budget committee. From there the technology budget was “reviewed the same as facilities and maintenance and instruction and what not,” but even though Jeffrey was not a part of the administrative team, he got “invited for that discussion.” Jeffrey did not think of the technology budget as his budget; to him it was “just in the instructional line.” Because the principals and himself had “all agreed on every single item that went” into the technology budget, there were no “sacrificial” items in the budget either. Jeffrey did not believe that there should be “things... that could be cut to make room,” yet in the budget he was currently working with, sacrificial cuts were being made, and he was “not happy about it.” Even so, Jeffrey believed in the process and said the transparency he used in presenting the budget made for less “deal-making” and that the budget-making process had “been one of the better ones” he had worked with.

Robert. Robert was the technology integration teacher and had been doing that job for the three years prior to the interview. He had been an educational technician in the building for seven years and a substitute teacher for three years prior to becoming the technology integrator. Robert used a MacBook Pro for most of his daily work, used a smartphone as his primary device for checking emails and sending messages, and used an iPad Air for working on tutorial videos and working with students to create videos for classroom instruction. Robert also used an Apple TV and a flat-screen TV or digital projector for classroom instruction.

One of Robert's primary responsibilities was to provide individual and staff professional development. He had his own budget for his classes but did not work with the district technology budget except to "offer input on" it. He helped write the district's acceptable use policies and student expectations for use in the student handbook and talked to groups of students about the day-to-day utilization of the technology devices the students were given. Robert was also a part of the technology visioning committee, which he stated had been dissolved and was now considered the "tech working team" because they had "visioned," and their "vision was approved."

Regarding his own professional development, Robert said there had not "been much." Most of his professional development had been "self-study online," but he also completed a master's degree in Instructional Technology. Robert also attended the MLTI trainings that were offered and attended "a couple of ed camps" around the state. For support with technology, Robert said Jeffrey was his "absolutely my number one" and felt well supported at the district-level administration and by parents. Robert felt that the only place he did not feel supported was in the offering of professional development for staff, since "there just isn't time" with all of the

mandatory trainings that teachers have to take with the few teacher workshop days the district had to use.

Rodney. The assistant principal, Rodney, had been in education for 14 years. Rodney used a laptop and smartphone daily and was given an iPad but did not use it very often. He mostly used his devices for calendar management and communication. Rodney did not get involved in many technology leadership activities but had done such activities in years past when the school had an interim principal. However, he did say that if there was "a new product" that the school was adopting, he might do "some of the training for teachers and... administrators in that program." He added that "it's more me leading the effort to teach them how to use a technology program, if that makes sense" Concerning decision-making about technology, Rodney knew there was "a technology committee" and had been involved with it "a few years ago." He related that he was "very trusting that the technology coordinator and his crew, along with the technology integrator and the other tech integrators and the principals" made those decisions well. Overall, he said, the process was "pretty inclusive."

As Grand View was a K-8 district, the technology leaders did not have any less responsibility for performing the duties required of technology leadership. Angela, the principal, and Jeffrey, the technology coordinator, worked together on creating a budget that would be passed by the voters, while Robert spent most of this time working with staff and students and Rodney stayed busy with his assistant principal duties. There was some frustration from Angela at not being included in the technology visioning process, and comments from Robert and Rodney indicated a technology committee had been used in the past but was not meeting at the time of this study.

Beliefs in the Value of Technology

To the technology leaders in the Grand View School district, technology was a valued communication tool and could also be a valued tool for teachers to use in teaching students in different ways. Jeffrey mentioned, however, that teachers were really just "scratching the surface" of what students were capable of doing with the technology, while Robert talked about how the use of technology was now being seen as supporting good teaching practices.

Angela believes that technology is "things that are electronic in nature that help make the world a little more efficient." In the school setting, Angela thinks of technology as "iPads and projectors and cell phones" and thought about the "kind of instructional pedagogy" that should be used with this technology. For herself, Angela uses her smartphone as her "primary tool." She also uses the iPad many times during the year, but not always on a daily basis. Angela said her "primary use of technology" is communicating "through email weekly to my staff." She mentioned that technology is important as it provided "speed and ease of access" and "consistency" in her communications. She helps to "run the social media" sites for her school and feels that technology helps her to bolster "positive communication" with parents.

To Jeffrey, the systems he uses are "incredibly valuable to me" and feels that it is important to balance the budget so schools are not spending all of the money on "stuff" but are spending more of the money "in service to the students." Having technology systems in place and "being organized" is very valuable to Jeffrey, as it allows him to "have focus in other areas" and to be able to go away during the day "and not have to worry about the phone ringing every five minutes."

With technology and the teaching staff, Jeffrey feels that teachers are "very basically scratching the level of what...the students are capable of doing in the classroom." He thinks this

is because the teachers are “staying in their comfort zone” and are only “asking students to do the things that they've now learned the students can do with the device” while abstaining from pushing the students to do anything different. He mentioned seeing “a lot of writing going on these devices” and that writing is “the number one assessment that happens on the devices,” followed by research. This is, Jeffrey says, “something that I think we need to work a little bit harder in,” and hopes that a new learning initiative on expeditionary or project-based learning will help. Such an initiative might let “the different uses of the device be a natural consequence” of the learning and would therefore present opportunities for the technology staff to “jump in” and offer professional development geared towards using the devices in a deeper way for learning.

Robert looks at “little T technology” as “a tool” either created or refined to do “a specific task or a number of tasks,” saying that even “a rock can be technology if you are using it to perform a task.” He considers the wireless devices such as iPads, computers, calculators, projectors, and LCD TVs as the evolution of tools being used for a specific task. On thinking about how the technology leaders envision technology, Robert said the following:

> It's funny... we have talked now about not focusing on the technology necessarily, and the tool...but what job do you want it to do, and...reverse engineer how we can use the tools at our disposal to optimize that goal...you know, they say nobody ever enters a hardware store because they want a drill bit; they enter a hardware store because they want a hole, and so there's a lot of different ways, technologies, to get that hole but the technology was a means to that end.

Rodney believes that technology is “mostly just the use of electronic devices,” and said at “this point when I think of technology I think of online devices as opposed to just word

processing, for example." He feels that technology has a "simple, direct value" by "enhancing efficiency" in his workflow in areas such as saving time and mass communication. One example Rodney gave was using the calendar system; he could check his calendar from his smartphone no matter where he was in the building. He believes there are "elements of... using it for creative purposes and producing things that look nice and are presentable," but for him it is about workflow efficiency.

The technology leaders at the Grand View School District all valued technology but in subtly different ways. To increase workflow efficiency, as a means to an end, as a means of reaching deeper learning, and as a communication tool were some of the different ways the technology leaders valued the technology integrated into their school.

The Making of Technology Decisions

The decision-making concerning technology in the Grand View School District appeared to be led by Angela, Jeffrey, and Robert together. As will be seen, the big decision that was on everyone's mind at the time of the interviews was the decision for the district to use iPads instead of MacBooks in the one-to-one program. What follows describes how and why that decision was made.

Angela has discussions with the Jeffrey and Robert about her beliefs in technology, saying that in her mind technology needs "to be used to create... the output of what we think we know." These discussions were part of the decision to continue with iPads in the school district, with Angela saying that the "decision [lay] primarily with myself, Jeffrey, and my tech integration teacher; we didn't go out and survey parents and ask... I mean I think we discussed it as a staff, but I don't think we took a formal vote per se." As she explained, the leadership team

“just felt like...people were using it who have had the training and they're using it well” and so it was “pretty much the leadership team” that decided on iPads over laptops.

Jeffrey also explained that in making the switch from laptops to iPads there was “not a decision-making process” and that “ultimately, decisions rest with the school administration.” He did say that people had input, more for identifying questions or concerns staff may have had about the proposed change, but the final decision rested with himself and with Robert and Angela. Jeffrey said that Angela was explicit about defining a vision when she was hired, and told him that “this was a vision for the school; if you hire me as the principal this was what I want to do in the school and... I'm going to come into this community and find out what it's about.” She told Jeffrey, “I'm going to be doing this in the next couple of years,” and so she needed “a solution” because she was “seeing what people are doing” and knew they needed “to change.”

Robert was also involved in the discussions to move to iPads a few years ago even though he “wasn't directly part of the decision-making tree” he had just been hired. He stated that the school “needed disruptive change; we were stagnant in the word processing and keynote creating universe.” The hope in moving to the iPads was that it would “prompt a change” in how teaching was done, with Robert saying that “we need to continue to kind of innovate what we're doing [and] can't take that step back [and so] you've got to fully commit to it.” According to Robert, the visioning committee was not involved in making the decision to go with iPads. Robert also brought up that the high school technology coordinator has made the decision to move to the iPads as well, but the high school staff has been “militantly against the decision since.” Robert thought the high school was most likely going back to laptops in the coming school year.

In contrast, Rodney, as the assistant principal, is “less in contact” with technology decision-making, and said he is “very trusting that Jeffrey and his crew, along with the Robert and the other tech integrators and... principals really lead those decisions.” He did say that the board of directors was personally interested in the “landmark decision” to change from MacBooks to iPads and that he “was at a board meeting when that was being discussed.” He felt the decision-making process was “pretty inclusive,” adding that he was not “included in the process” but was “very comfortable with not being included because I have no desire to be included in more than I need to be.”

In the Grand View School District, the decision-making process appeared to involve mainly the principal, technology coordinator, and technology integrator. An example of a major decision was brought up by all three technology leaders: the move from MacBooks to iPads for staff and students. This move was explained by Robert as being motivated by pedagogical concerns, where there was a need to “prompt a change” in the teaching staff to innovate using technology. The final decision on the iPads versus MacBooks was made by Angela, Jeffrey, and Robert together but with some staff discussion about concerns teachers may have had. Rodney, the assistant principal, trusted Angela, Jeffrey, and Robert to make the decision and was glad to not be a part of that process.

Communications with Staff

Conversations about technology in the Grand View School District were between the technology leaders and between the technology leaders and staff. Conversations often took place in a classroom, when a technology leader was visiting a classroom or providing assistance to a teacher using technology; sometimes, the conversations happened in the hallways. There was

also evidence of conversations about technology with upper administration, the board of director, and parents.

Angela talks with Jeffrey about technology hardware, such as “laptops, iPads, screens, projectors.” She talks with the technology integrator, Robert, “about things like flipped classrooms, using video to enhance learning, air dropping.” She also talks with teachers about items in the “instructional domain,” asking, “Are you using it in a way that's actually enhancing learning, or are we just using it to use it?” “We're pretty good,” she says, “at using [technology] to enhance learning.” The principal also talks with the assistant principal about technology but declines to specify what the topics are. The conversations Angela has with others about technology happen mostly in two places: when she is “walking through the building and I'm looking at the building for facility and summer work” or when she is “visiting classrooms, giving feedback about lessons usually or... talking to teachers about classes.” With upper administration, the principal talks with the superintendent and assistant superintendent about the district’s technology vision, the technology plan, and the current equipment levels at the various schools. The assistant superintendent is the one who chairs the technology committee for the school district.

Jeffrey has “different conversations with all kinds of people” about technology. He “could be talking to my tech integrator about a long-term project that we want to see folks do, and that's more of a strategic conversation.” He could be “talking about technology with my principals who are looking at it from sort of a budget perspective but also that they have educational goals that might need some technology to go along the way.” He could be “talking to teachers, trying to get... some of them who... have an idea and they want to refine it.” Or he also may be talking with some teachers “who don't necessarily buy in,” which, given the importance

of getting “people to buy in,” would mean taking “time away to the detriment of other things” in working with those teachers. He could be talking to students “who simply come down” because they were stuck with a project. He could be talking with community members, such as parents who were “really... excited about something” or, conversely, were “not so excited about something.” He could also be talking to board members about a “long-range plan” and with vendors who call. Jeffrey felt that he was “the point person for all this different communication that's going on and it's a wonder sometimes that I get anything done with all the talking that I do—including talking to researchers!”

Jeffrey said there is something “interesting thing about all these conversations.” He believes the conversations have “gotten to the point” where the staff has concluded that “technology was here... to stay” and that the “train has left the station” on technology in schools. Thus, his conversations with staff about technology have become conversations about “empowering people to be able to actually take the next step, whatever that step may be.” He found it interesting that “we spend so much time focusing on how students learn that we don't really get how we learn ourselves, especially when it comes to technology.” These conversations about technology happen in many places, such as Jeffrey’s office in the main hallway at the school where staff stop when walking by. He calls this the “fishbowl effect,” as “they just sort of walk by the glass and then they stop.” Jeffrey does not spend much time in classrooms unless it is in supporting a teacher with a specific technology during a class session.

Robert considers Jeffrey his “point person,” as they have “shared an office for two years” and so are always “brainstorming or complaining” together. Robert also feels comfortable talking with Jeffrey about teaching with technology, because even though Jeffrey is considered to be “on the wire side,” Jeffrey “had taught for a few years” and so is “a really good sounding

board for that." Robert also talks with staff about technology, saying that "a lot of the times... when I'm talking about it, I'm talking about how to use it." With Angela and Rodney, Robert is usually discussing discipline issues, and with Angela he also talks about professional development. Since Robert does not "teach that many class periods" and is "free to roam," he often talks to the "people [on the] staff" about technology. Robert also attends monthly technology meetings with the technology integrators from the elementary school and the high school; the technology coordinator for the high school, Jeffrey; and the assistant superintendent to discuss vision around technology use.

With the students, Robert does "some work around digital citizenship" and teaches "all of the 8th graders the programming class; it is a required elective for them." He is responsible for holding "three or four parent nights a year," with the first parent meeting being the MLTI parent meeting for the seventh and eighth grade parents. At that meeting parents are given expectations on the use of the devices being given to students and are also told about "some of the risks and dangers" to watch out for. Later in the year he chairs a forum where parents are given the opportunity to bring up "what kind of successes and failures that they were having and seeing at home with their kids."

Rodney talks about technology mainly with Jeffrey, usually concerning the state standardized tests or the student information system. For example, he is working with the Jeffrey on the new master schedule in the student information system. Sometimes teachers talk to Rodney about technology, as he is considered "more tech-savvy than most of our staff." Most of these conversations happen in person but can also take place over email, although not as frequently.

The technology conversations in the Grand View School District were both lateral in nature among the technology leaders and vertical in nature when talking with upper administration, board of directors, or parents. Angela and Jeffrey spent time discussing the vision of technology use and how staff members were doing in making the vision happen in the classrooms, while Robert furthered those conversations in the classroom with teachers. Robert also spent time discussing technology issues with the students in his classes.

Beliefs About Student Use of Technology

Each of the technology leaders in the Grand View School District had a slightly different set of values then the others, sometimes with a view being at odds with another leader's view. Overall there was a consensus technology should be in service of learning and that technology helped to provide different modalities of learning for students.

Angela believes one of the values of technology use is engagement, saying that students "have an inclination towards technology because they're exposed to it so young and so frequently." She likes that technology allows students to "create things and produce things in a different modality" and that the "video aspects" of technology are "really compelling to the kids," as the kids are "like the reality TV generation [and] love that stuff." She did say she "wouldn't... want to overuse technology because of engagement" because she feels "kids are naturally curious and engaged anyways," and "technology just gives us one more medium like art you know to engage kids just one more way." She also believes that the technology helps her teachers with "efficiency," saying that "a lot of our teachers use Google classroom and most of our language arts teachers do Google Docs... they do [student] feedback online until they do the final grading and then they'll print."

Angela also talked about the iPads in use in grades 6 through 8, saying the iPads are preloaded with approved applications for all contents areas that the students are allowed to use. Some examples of the applications loaded onto the iPads are dissection applications for science and applications in math. Angela also mentioned the use of Adobe Voice, which is used for creating presentation style assessments; this is so the students can show what they know "through a different format other than a traditional assessment." During Angela's first year, social media applications were left on the iPads, and according to her, "it was just horrendous." She said the next year those social media applications were removed from the iPads.

Jeffrey said that "one of the things that I think was too often considered" with technology was the "engagement factor." He thought that the engagement factor "was a bit overstated," as "it's not a natural consequence of using an iPad that that makes an activity more engaging." He said there is "mobile technology everywhere," and though he would not say mobile technology has "over-saturated our life," he believes that mobile technology is now a "part of the Lexicon—it's not going away, it's kind of expected." Jeffrey believes that the technology in use in the district benefits students by helping them "take it to the next level." To Jeffrey, the next level is one on which they "can… do things with communication, can… do things with collaboration [and] have access to resources or to outlets that they previously did not have... in that classroom space." Jeffrey believes that the "barriers to entry" in doing those next-level items has "simplified to the point where... now it's there and ready to use." The question for him is "how do we get more utilization... it always goes back to that."

Robert used his background in radio to view the students as an audience to trick them "into learning stuff" via entertaining and engaging projects. He believes the "iPad is a transformational tool in education because it's portable, it allows you to do multimedia, it allows

you to engage with things kinesthetically, it moves us away from writing everything down because we don't need to do that, and so... it just was that perfect storm of like... we're in a good space now to be able to do some really cool things." Finally, he wants students to "to be able to play and learn and do it socially and do it independently and do it autonomously and teach me stuff and just be part of" the learning experience.

Robert believes "there are a thousand ways to teach a lesson, so if you're going to use technology it's not going to be used for technology's sake." He thinks that technology "should be used for a purpose." He believes technology can "help facilitate routines" in the classroom, as in having a slide up on the TV or whiteboard in the classroom showing what materials the students would need for the day. He also believes in the value of video-based tutorials for the students since the students could "self-pace" themselves in learning the material. He said that "a lot of the systems I've created in my regular management as well as teaching would be impossible to do without the use of technology." He values modeling the use of the different technologies and uses his classroom as a "working lab" in which he can "share those things with other teachers and also experience any potential frustrations that they may have" by using the classroom technologies himself.

Robert also believes that "the number one thing that we can use our devices to do was differentiate instruction" and is "a huge proponent of a blended learning platform where students can work independently." Robert said that "one thing that you cannot create more of [is] time in the classroom," and thought that if teachers "need to spend... 20 minutes a day teaching a lesson, that's time that's taken away from students to practice with the expert in the room." Robert is a "huge proponent of having teachers create their own videos" to show students how to do things because he liked that "it's their voice, their vocabulary" and that because of that there is a

“comfort level there that the kids” would have. Robert believes “the number one way that these devices can enhance learning and... play to the strength of the students” is if the technology is used to demonstrate student learning, writing, or reading by having the students speak or record their answers. Then, if a student has a writing problem but knows the science, and the perceived science problem is actually a writing problem, the student can “speak it or record... an answer to a question; then they're demonstrating their learning and their writing or reading or whatever; their ancillary problem isn't going to be obstructing their ability to demonstrate what they know.”

Related to the technology used in instructional practices, Rodney said that “obviously we've made a choice to go iPads and were conscious in that choice.” In his classroom visits the Rodney sees a “fair amount” of word processing on the devices in the classroom, with students working on papers and taking notes, but has also observed students working on presentations. Rodney did see the art teacher and technology integrator using photo editing programs with students and has seen the music department use GarageBand. Rodney also observed students using online content. Rodney said the “key thing’ in using technology is “not to just... use technology for the sake of using technology.” He believes that technology has leveraged “a lot of chance for us to have more authentic work” with students, and also believes that technology allows students to do what he called “worthy work” in which students are contributing collected data to “main citizen science” groups outside of the school. He believes there is a “huge power” in having students be a “massive” group of people that could be “generating valuable work” with “data that was actually meaningful.” He believes this gives students an “authenticity of work and purpose.”

As the assistant principal, Rodney also sees the drawbacks to younger students having access to technology that allowed social interactions online. He related that he has “become

much more skeptical of technology as a whole" and sees that technology can have a "corrosive effect" in people's life, including student's lives. He talked about "dealing with kids that can't interact and they can't successfully be with other people," and thought part of that might be that the students were "so glued to devices and addicted" to the devices that "unless we're going to use it for something purposeful," there was "actually a lot of harm in just using it just for the sake of using" the technology.

Rodney's caution aside, the technology leaders in the Grand River School District all believed in the value of technology for helping students attain learning objectives even if there was disagreement over the use of technology for engaging students. To Angela and Jeffrey, the ability of the technology to help student learn in different ways was an important reason for having the technology; Jeffrey also believed that the technology could be used to move learning to a new level. Rodney believed that marrying the technology with a sense of purpose would make the learning with technology an authentic experience for the students.

Summary

The technology leaders at the Grand View School District all valued technology for different reasons. Angela and Rodney liked the benefits technology provided for workflow efficiency, while Jeffrey and Robert focused on how technology was useful in enhancing learning for students. Regarding the decision-making process for technology, Jeffrey said there was "not a decision-making process," while Angela did solicit some staff input informally. Jeffrey, Angela, and Robert together made the final decisions regarding technology. Rodney was happy to defer to the three technology leaders. Technology communications in the Grand View School District involved Angela and Jeffrey spending time discussing the vision and implementation of technology use, while Robert talked with classroom with teachers and

students. All of the technology leaders in the Grand River School District also believed in the value of technology for helping students attain learning objectives. The use of technology to help students learn in different ways and having technology help students progress to the next level were seen as important reasons for having technology for the students.

When asked how they felt their school or district was doing related to other schools or districts in Maine, Angela and Rodney believed their school was ahead of the curve, while Jeffrey and Robert believed the school was about the same as other schools in Maine. Angela believed her school was "ahead of the curve" when compared to other schools in Maine. She stated that "I've never worked in a district that's so financially capable before, so to have the financial resources to provide the level of technology we do makes me feel like we're ahead of what would be the norm in the state of Maine by a lot... to be one to one, to have a screen and projector in every room, have Apple TVs where kids can airdrop, I think it's exceptional but I also have to be honest I'm new to this state... so I'm not sure if that's an accurate picture or not."

Jeffrey did not feel that his school was particularly advanced concerning technology use but felt that the school was "just right for where we are as a school district." He said that the two schools in his district were "sort of different in... the methodology behind what's going on," but believed that ultimately the administration wanted "the students to come up through and have a consistent experience." In his opinion, "that's the way it should be."

Robert admitted he has "pretty high expectations" for his school but felt that "we are probably right where the rest of the people are in some regards; I think we're probably a little further ahead in others." However, he admitted that "I really don't know where we are." He did feel that his school has "a wonderful opportunity with... the devices to be... one-to-one third through eighth grade—it's pretty awesome." He also felt the school was "getting better every day

with the way that we're managing and thinking about how students are using... these devices." But he was "disappointed that we're not farther along because there were so many opportunities for good teaching and learning that we're just not taking advantage of... because we have had the resources to be ahead." He wondered if being good was the issue in that "the biggest enemy of great was being good." He wondered if the district needed "to slip a little bit" or "get behind the curve" in order to move from good to great.

On his district's technology efforts, Rodney said, "I think if you look at the state of Maine, it seems to me like we have to be way ahead of the curve." He did say that "compared to my brother who's in education, for example, we're... ahead of the curve." Yet, for Rodney, it was hard to "really know where the curve is." He did believe that the district was "on the right trajectory" and has "good people in place," which made him "feel good."

CHAPTER 5

DATA ANALYSIS

The purpose of this comparative case study was to describe and understand the nature of technology leadership in three Maine public school districts and explore the values and beliefs of technology leaders in those schools. Three research questions guided this study:

1. What are the roles and responsibilities of technology leaders in three Maine public school districts?
    a. How are technology leadership responsibilities shared and distributed amongst the technology leaders and/or other teachers and staff?
    b. What is the nature of communication and interaction between technology leaders and other teachers and staff?
2. What are the values and beliefs of the technology leaders concerning the use of technology?
    a. What are the technology leader's beliefs about the use of technology in instructional practices?
    b. What are the technology leaders' beliefs about the student's use of technology for enhancing learning?
3. How do technology leaders mobilize stakeholders in using technology to positively influence student outcomes?

An examination of the roles and responsibilities of technology leaders was chosen for analysis in order to view across the case study sites how differences in the technology leadership staffing might affect decisions regarding technology and the nature of communication and interactions between technology leaders. The values and beliefs of the technology leaders were

analyzed in order to identify agreements or conflicts between their values and beliefs. Finally, the extent to which technology leaders believed they mobilized stakeholders in using technology to influence student outcomes positively was analyzed to view how the values and beliefs of the technology leaders translated into efforts at helping teachers use technology for student learning. Data analysis was made through a comparative case analysis that was organized according to the research questions, analytic insights, and themes that emerged during the data collection and analysis process. As the case study sites were chosen for their differences, the analysis focused on uncovering similarities among the case sites (Vogt, Gardner, Haeffele, & Vogt, 2014).

This chapter is organized as follows. The first section introduces a set of diagrams that show the patterns of organizational structure**,** decision-making, and communication found in the cases. These diagrams provide the context for a discussion on the roles and responsibilities of the technology leaders that lead to the introduction of a new conceptual framework for technology leadership that incorporates the use of power and authority by the technology leaders. The diagrams also provide the context for findings on decision-making and the nature of communication that result from overtasked and under-resourced technology leadership among the cases. An analysis of the values and beliefs of the technology leaders follows, and is itself followed by a discussion on the extent to which technology leaders believed that they mobilized stakeholders in using technology to influence student outcomes positively. These discussions lead to the finding that teachers are not full partners in leading the use of technology in the cases. The final section reveals the summary findings for chapters 4 and 5.

Case Leadership Diagrams

In order to aid in visualizing data for the case analysis, I have adapted Mintzberg's five-sector "logo" (1979) to depict the patterns of structural organization, decision-making, and

interaction that were seen among the cases. The diagrams show the organizational structure**,** decision-making, and communication patterns found in the cases. These diagrams provide the context for the discussions and findings presented later in this chapter.

Big Valley

At Big Valley, as shown in Figure 5.1, the technology leaders were the director of technology, principal, curriculum coordinator, and director of guidance. Of the four leaders, the technology director, Marge, was the leader who managed the day-to-day technology operations at Big Valley, managed both the creation and passage of the technology budget, and controlled the expenditures. Marge interacted with all technology leaders, teachers, and staff members in instructional matters, denoted by the white arrows, and in technical matters, denoted by dashed black arrows. Marge was also the primary decision-maker, depicted by the large black arrow pointing up to the superintendent of schools. Marge did receive input from Philip, the principal, on certain decisions, and often asked the admin team for input on technology decisions. The curriculum coordinator, Susan, influenced Marge on decisions, but Susan trusted Marge in technology matters and abstained from making technology decisions whenever possible. The guidance counselor, Joan, spent time working with both Marge and Susan on the student information system; these interactions were mostly a technical nature. Philip, however, helped Marge make decisions about technology and interacted with Marge and the teaching staff concerning instructional technology.

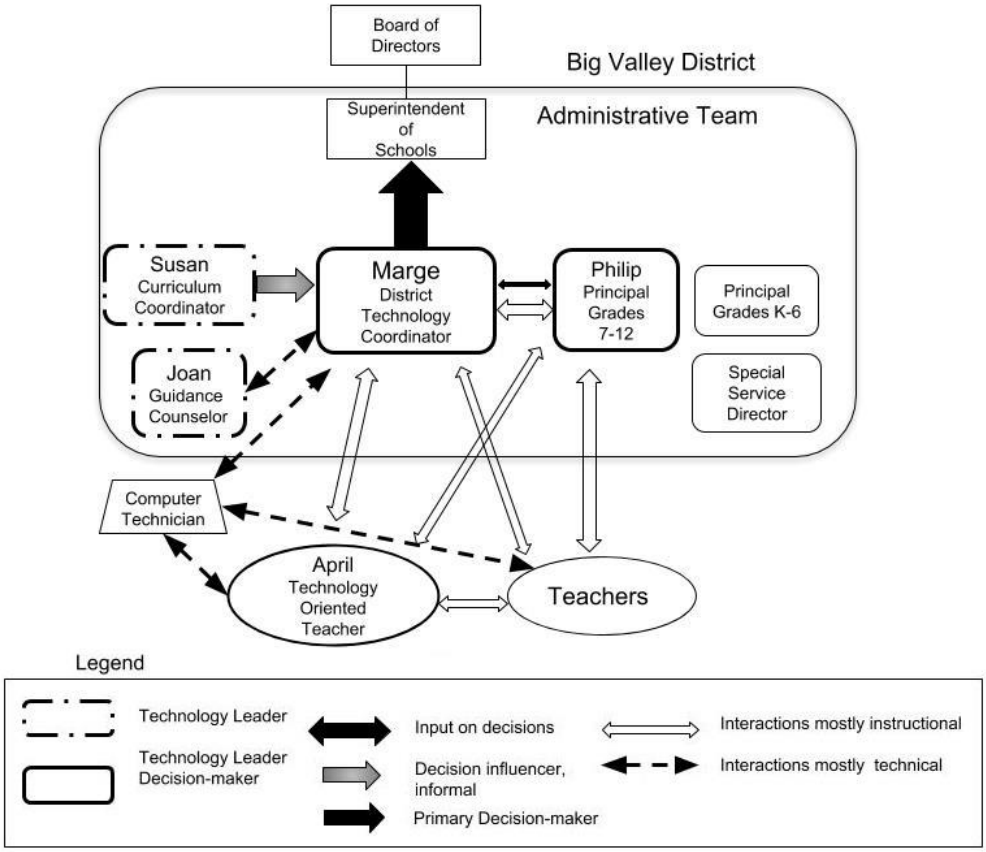

Figure 5.1. Big Valley.

Broad River

In Broad River, as shown in Figure 5.2, the technology leaders included the principal, assistant superintendent, technology technician, business/technology teacher, and library educational technician. The fiscal duties concerning technology procurement and maintenance were performed by Jennifer, the assistant superintendent, while the day-to-day technical operations were overseen by Steven, the principal, and performed by the technology technician, Chad. Jennifer interacted most often with Steven, the principal, concerning instructional matters and also involved Steven in technology decision-making; these interactions are depicted by white and black arrows. However, the decision arrow is thickest from the assistant superintendent to

the superintendent, as Jennifer usually decided which technologies to use based on the impact on the budget. Both Jennifer and Steven interacted with teachers concerning the use of technology for instruction; these interactions are depicted by white arrows.

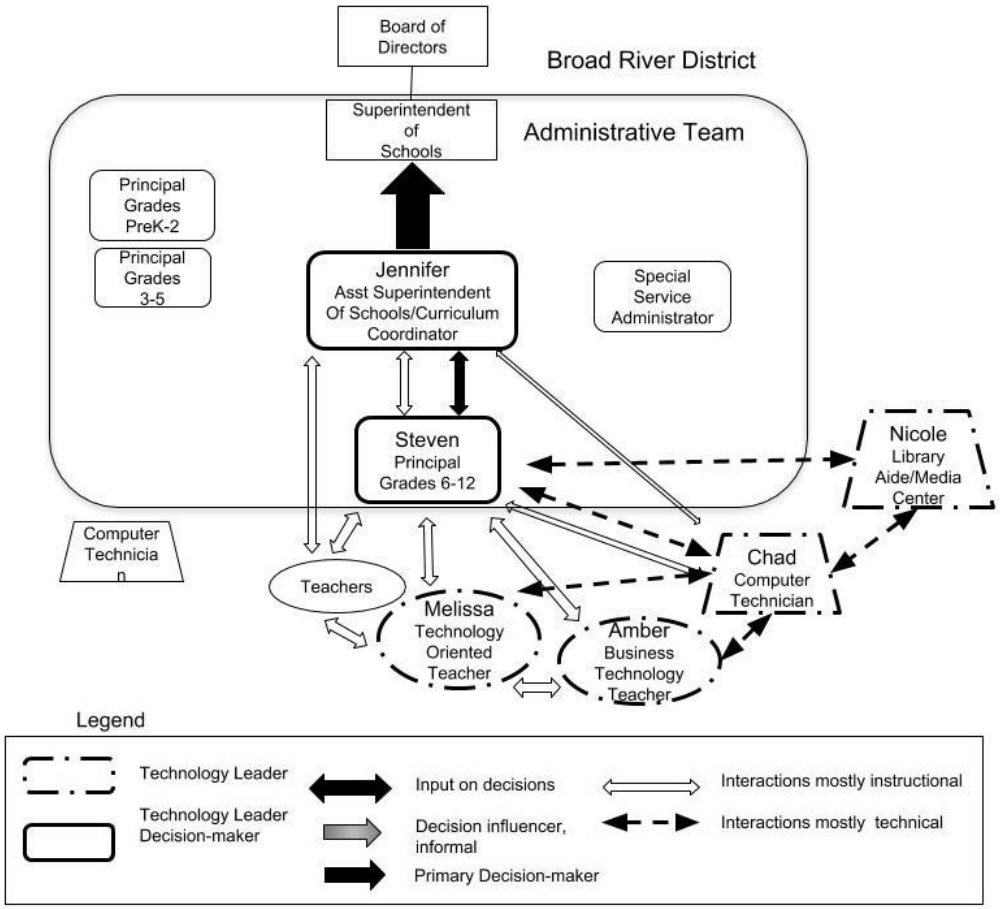

Figure 5.2. Broad River.

The remaining technology leaders—Chad, Amber, and Nicole—worked with each other daily on technical issues. Chad and Amber talked with the principal about instructional technology matters; these arrows are depicted by white arrows.

Grand View

At Grand View, as shown in Figure 5.3, the technology leaders identified were the principal, technology coordinator, technology integrator, and assistant principal. The technology coordinator, Jeffrey, managed the day-to-day technology operations and was responsible for creating the technology budget. Once Jeffrey completed the budget, he then left the defense of the budget through the budget process to Angela, the principal. Jeffrey and Angela interacted concerning instructional technology matters, and Angela was involved in making technology decisions with Jeffrey.

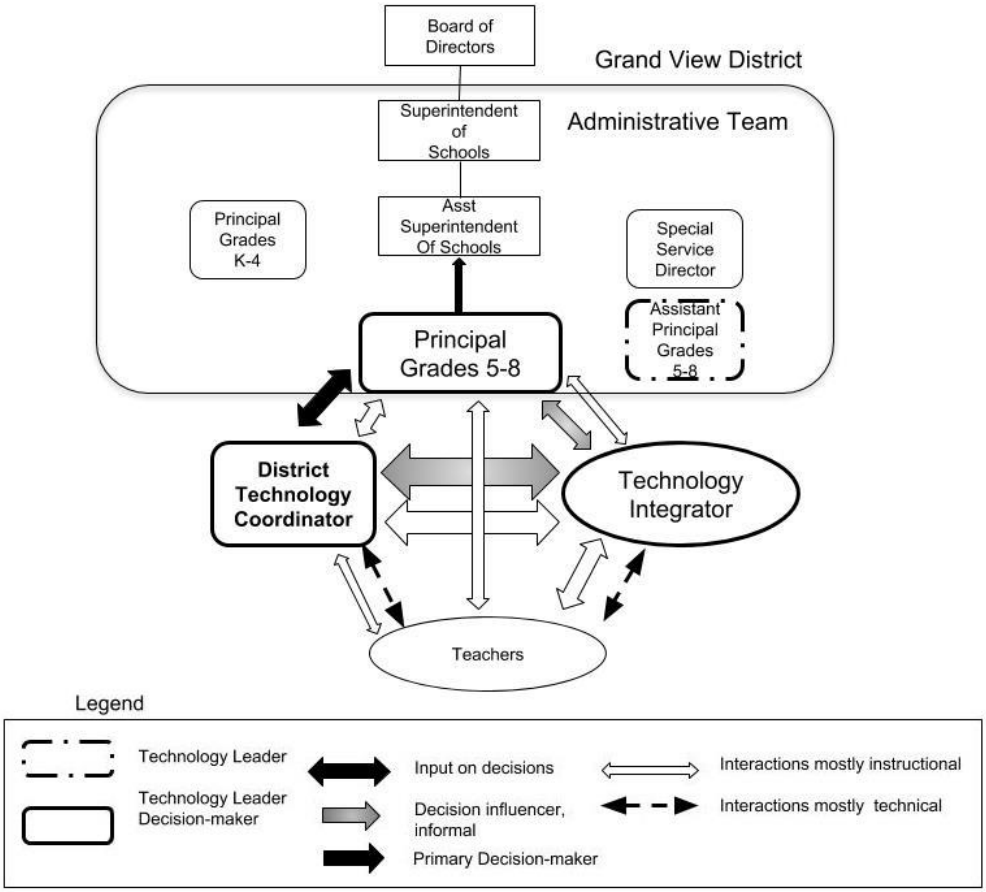

Figure 5.3. Grand View.

The technology integrator, Robert, heavily influenced decisions on instructional technology and worked with both Jeffrey and Angela on the technologies that were in use at Grand View; this is depicted by the gray and white arrows connecting Robert with both Jeffrey and Angela. The gray arrow between Jeffrey and Robert is sized larger than the black arrow between Jeffrey and Angela to signify the greater influence Robert had on decision-making than Angela had. Jeffrey and Robert interacted with teachers for both instructional and technical reasons throughout the day; these interactions were noted by the white and dashed arrows between them and the teachers. The remaining technology leader, the assistant principal Rodney, worked with teachers on the student information system or other software packages on occasion but spent the majority of his time on assistant principal and athletic director duties.

The Integration of Technology Leaders into School Leadership Structures

The creation of these diagrams aided in displaying the complexities in interaction among the technology leaders, teachers, and staff in the cases, and was instrumental in untangling the roles and responsibilities of the technology leadership. Creating the diagrams also allowed me to step back and examine how the technology leadership positions became integrated into the traditional school leadership structure (i.e., from before the days of computers and networks). In Figure 5.4, I created a typical traditional school structure as it might have existed prior to the introduction of computers and networks. I also listed from memory some of the underlying technologies that were in use by the teaching staff at that time. Of note is that paper, pencil, and pen were the staples of all school budgets, grade keeping, communication, and record keeping.

In the right side of Figure 5.4, I created the school structure equivalent for the post-computer and network age. There is now an almost parallel leadership and support structure in schools to help implement and support the computer and network infrastructure that has become

embedded over the last forty to fifty years. The traditional school functions of budgeting, grading, and communication are all still present, but now computers, laptops, and networks are used for those functions. Likewise, the classrooms still have paper, pencils, etc. but now also have laptops, devices, and a network to support the use of software from the Internet.

There are three elements from Figure 5.4 that will become important in the analysis presented later in this chapter. First, at the center of both the traditional and modern-day schools are the teachers, and the increased number of "opportunities for interaction" lines between the teachers and the technology personnel illustrate the overlapping lines of communication that will

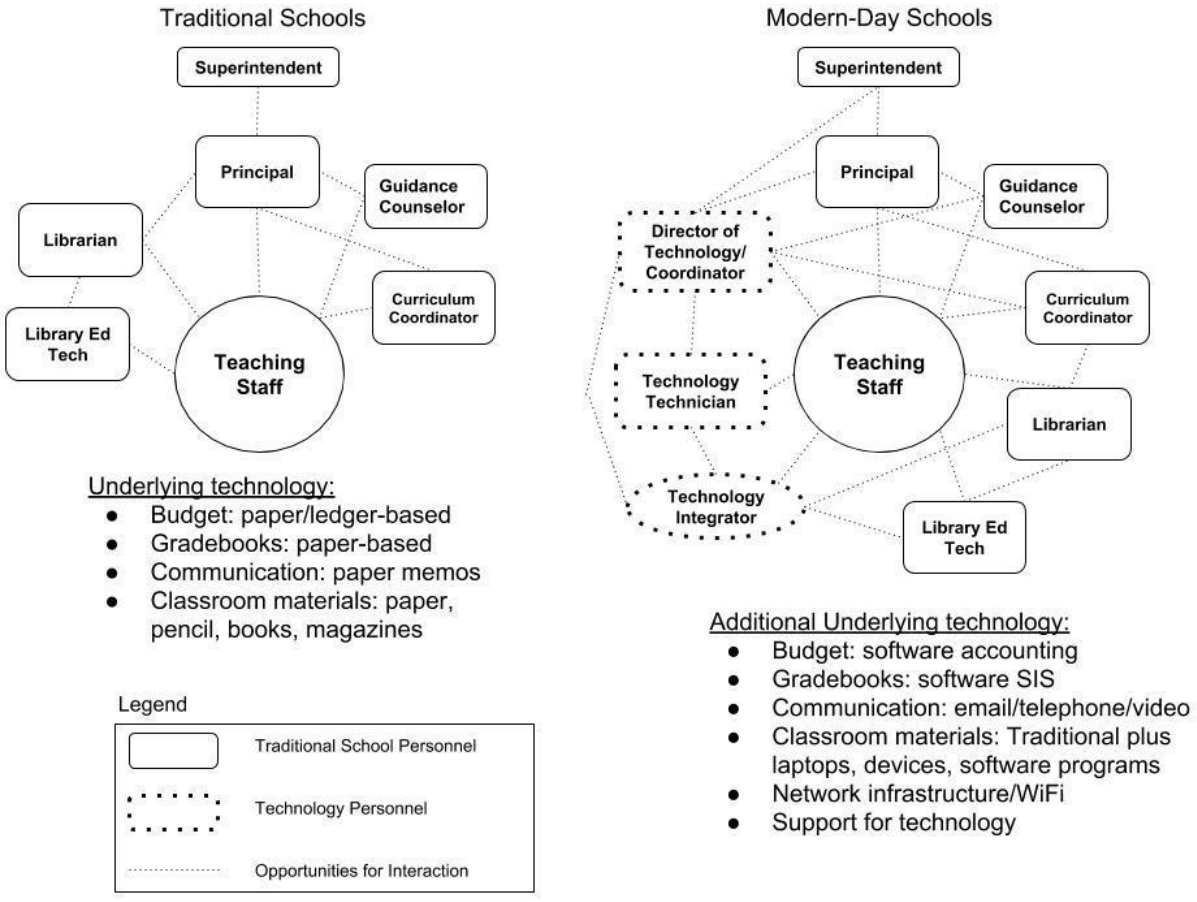

Figure 5.4. Traditional Schools versus Modern-Day Schools.

factor into the analysis on roles and responsibilities. The second element is that personnel responsible for doing the budgeting, grading, and communicating in the modern-day school are now, in most cases anyway, using software programs for managing that school data and have become to be perceived by their coworkers as technology leaders owing to this expertise. This element will be become important in the analysis later. The third element is that the increased personnel and infrastructure costs for maintaining and managing the technologies in use have budget ramifications for both personnel and equipment. In the next section, I will unpack the roles and responsibilities of the technology leaders from the cases and show how my conceptual framework from Chapter 2 was inadequate for my analysis; I will introduce a new conceptual framework for understanding technology leadership as a result.

Roles, Responsibilities, Power, and Authority

From the literature, I had developed a conceptual framework for technology leadership that contained elements of distributed leadership (Spillane, 2006). Distributed leadership added the idea of multiple technology leaders, both formal and informal, which seemed a good match with the variety of technology leaders that I saw in the cases. Distributed leadership also added followers as part of the technology leadership situation and included interactions between the technology leaders and between the technology leaders and followers.

During the analysis process, I came to believe that the distributed leadership framework was inadequate to explain the power dynamics I saw in the data. If technology leadership was distributed, then I would expect to see both the different roles and responsibilities being taken on by different technology leaders and those leaders being given the power and authority to execute those responsibilities. As I will show in the subsequent paragraphs, this was not the case among technology leaders in the schools studied.

I searched the literature for definitions of *power* and *authority* that might help me understand what I was seeing and found two definitions that I included in my analysis. The first definition was from Heifetz (1994) and was called *formal authority*. This type of authority is where a leader is perceived as the "leader" owing to the designation of a formal title and position. Of the technology leaders in this study, the technology director, technology coordinator, and principal positions were the positions that primarily fell under that definition. The second definition of power or authority was what Conger and Konungo (1987) called *expertise-based power and authority*. This is when the leader is viewed as a leader not necessarily due to a formal title or position, but due to the expertise the leader displays and is respected for by other members of the organization. According to this definition, all of the technology leaders in this study had the potential to be expertise-based leaders depending on the skill set of the technology leader.

Formal Authority and Expertise-based Authority of Technology Directors/Coordinators

Analyzing the cases using the definitions of formal and expertise-based authority highlighted the complexities of technology leadership in each case and among all three cases. Two of the case sites had a formal technology director or coordinator. The director of technology at Big Valley, Marge, was responsible for grades K-12, created and defended the budget to the superintendent and school board, and performed many of the technical functions needed in keeping equipment and software programs running. At Grand View the technology coordinator, Jeffrey, had slightly different responsibilities and authority. Jeffrey was only responsible for grades K-8 but performed many of the same technical functions as Marge and created the budget. A key difference was that Jeffrey did not defend the budget to the superintendent or school board as Marge did. Jeffrey was adamant that even though he created the technology budget, he did not

consider the technology budget "his" budget; it was the principal's responsibility to get the technology budget passed. Jeffrey said his reluctance to defend the budget owed to his lack of membership on the district's administrative team, saying that he did not "sit directly on the team" but was invited to the team to talk about the technology budget.

Marge and Jeffrey were expertise-based leaders. At Big Valley, the guidance director, Joan, and the Principal, Philip, stated that anything related to technology in the district went "back to Marge." Philip, who had expertise from having been a technology integrator, resisted getting too involved with technology at Big Valley as he did not want to "ruffle the feathers," as he did not yet feel well established in the district. Philip stated he had great respect for Marge's knowledge and understanding of technology, so felt he did not have to think or worry about technology as a result. At Grand View the technology coordinator, Jeffrey, exercised expertise-based authority but preferred to include the principal and technology integrator in his discussions on technology. Jeffrey thought about technology strategically and would then go to the principals to get "buy-in" on a plan. The principal, Angela, also mentioned having discussions with Jeffrey and Robert, the technology integrator, about technology.

In contrast, in Broad River there was no position of technology director or coordinator, and in that absence Jennifer, the assistant superintendent and curriculum coordinator, assumed the functions of creating the technology budget for grades K-12 and defending the budget to the superintendent and school board. Unlike Marge and Jeffrey, Jennifer may have been responsible for technology in grades K-12 but was not involved in the day-to-day operations for technology and did not perform technical functions related to equipment or software. However, she appeared to retain the power and authority for technology based on the anecdotes related to me. Chad, the technician, often ended up having to do some of the technology director duties at the urging of

the principal, Steven. For example, Chad had to prepare the schools for new copiers on short notice. Amber, the technology teacher, summarized the situation by saying, “You know, there's no tech director, there’s nobody in charge of technology—we're just winging it which is kind of sad.”

Formal Authority and Expertise-based Authority of Principals

The principals in the cases were mostly examples of formal authority related to their duties as principals and not their technology expertise. The principals worked with the teaching staff on using technology for managing student scheduling and grades, helped teachers use technology for instruction, and arranged for professional development for technology during staff meetings and teacher workshop days. The principals also talked with teachers about technology for the classroom and included teacher requests in the budget if possible.

The power and authority that were used by the principals for technology matters differed somewhat by case. As mentioned previously, Philip, the principal at Big Valley, felt that he was unable to utilize his expertise in instructional technology because he felt he was “new” and didn’t want to “ruffle feathers.” Philip had been a technology integrator in a prior school district and had enjoyed “solving problems with technology” with the teachers in his previous district. At Grand View the principal, Angela, talked about doing “instructional visioning kind of work” as part of her duties but felt left out of the visioning process for instructional technology, as she was not involved in the vision planning for technology. She believed that the instructional vision for technology should also include the principal’s view and did not understand why she had not been included up to that point. Finally, at Broad River the principal, Stephen, did not appear to wield any formal power and authority, or much expertise-based power and authority, over

technology. Steven appeared to advocate for the "the latest and greatest" technology for teachers and students in the budget.

Formal Authority and Expertise-based Authority of Expertise-based Leaders

Other technology leaders were not directors, coordinators, or principals. The guidance director, curriculum coordinator, assistant principal, technology technician, educational technician, technology/business teacher, and technology integrator all interacted with teachers and staff in varying ways at their schools. The similarity among these technology leaders was that they mostly interacted with the teaching staff on a technical level in some capacity and were perceived by staff members as technology leaders due to their expertise. At Big Valley, the guidance director and curriculum coordinator were heavily involved with teachers and staff in using the student information system. At Broad River, the technology technician and library educational technician worked on maintaining and troubleshooting issues with the devices in use by teachers, staff, and students. At Grand View, the assistant principal helped the teaching staff with the student information system, and the technology integrator helped train and maintain the technology for instruction.

The power and authority exhibited by these technology leaders appeared to be solely related to the expertise for the technology they used. At Big Valley, the guidance director, Joan, and the curriculum coordinator, Susan, interacted with teachers and staff concerning the student information system; any discussions on other technology matters usually owed to their presence on the administrative team, where they could voice their opinions on the topic at hand. At Broad River, the technology technician, Chad, and the library educational technician, Nicole, were well regarded by the teaching staff for their expertise in helping with the devices in use by the teachers and students; Chad and Nicole also heard the teacher's frustration with the devices in

use at the school but had no power or authority to effect any change on that issue. At Grand View, the assistant principal, Rodney, did not address technology matters unless called upon to help teachers with the student information system, while the technology integrator, Robert, spent his time working with classroom teachers on using technology for instruction. As mentioned earlier, Robert did provide input into discussions about technology with the principal and technology coordinator, Angela and Jeffrey.

Inadequacies of the Distributed Leadership Framework

As I mentioned above in this chapter, if technology leadership was a distributed process, then I would have expected to see the roles and responsibilities being given to different technology leaders along with the power and authority to execute those responsibilities. I would have also expected to see followers, meaning teachers, as part of the technology leadership situation and seen interactions between the technology leaders and between the technology leaders and followers. In my analysis, I did not see examples of technology leaders distributing a role or responsibility. Nor did I see teachers partaking in technology leadership; there were plenty of interactions between the technology leaders and teachers, but those interactions were not in the service of distributing leadership. What I found instead, as seen in the previous sections of this chapter, was that technology leadership was a combination of formal authority and expertise-based authority as exercised by the technology leaders in each case. This analysis is the basis for my first finding, that technology may be viewed as three unofficial loci of power and authority that interact to provide technology leadership.

The Loci of Power and Authority

Once I moved away from the distributed leadership model and focused on the formal and expertise-based authority concepts, I wanted to see how the new understandings I had gained

would explain some of the other aspects of technology leadership I was studying related to roles and responsibilities; namely, decision-making and communication. In the previous section, I identified the formal authority leaders as the technology director/coordinator and principal and identified the rest of the technology leaders as expertise-based leaders. When I also included decision-making and communication in this analysis, I found a pattern of autonomy among the three groups that fit neither the distributed leadership model nor even the shared leadership model. The closest I could come to was what Gronn (2000) called a *locus of power*, concentrated in one center, and exercised by an individual. This idea of a locus of power seemed to be the most appropriate way of describing what I was seeing, and the locus groups I identified corresponded with the leadership groups defined in the previous section: the technology director/coordinator locus, the principal locus, and the expertise-based locus.

Both the technology director/coordinator group and the principal group correspond readily to a locus, as there is a single person in a position with formal authority and power at the center of the group. In the cases, the technology director/coordinator locus each varied somewhat at each site. Marge at Big Valley had the most authority, which was both formal and expertise-based. Jeffrey at Grand View had less authority, as he was not on the administrative team but still exercised expertise-based authority. Jennifer at Broad River had the formal authority but limited or no expertise-based authority.

The principal locus did not vary across the sites, but for different reasons. The principals in each case had the formal authority of being the principal and so had access to the teaching staff by way of instructional coaching and evaluation. However, Philip at Big Valley limited his use of expertise-based authority, as he was new at the position and did not want to disrupt processes or challenge anyone else's authority. Angela at Grand View wanted to be involved in

developing the school's vision of technology use but was left out of the formal process, and Steven at Broad River just kept an eye out for "what was new" for his teachers.

With the expertise-based locus, there is no person at the center; however, I view each expert in this locus as a separate, expertise-based locus within the larger locus of all experts. These technology leaders exert power and authority with the teachers and staff through the knowledge they possess concerning the technologies they use rather than through their formal authority as seen in the technology director/coordinator locus or principal locus. Figure 5.5 displays a Mintzberg (1979) representation of the three loci of power and authority described above. As in the earlier diagrams, the teachers are at the center of the three loci, and so there are corresponding opportunities for communication among the technology leaders, teachers, and

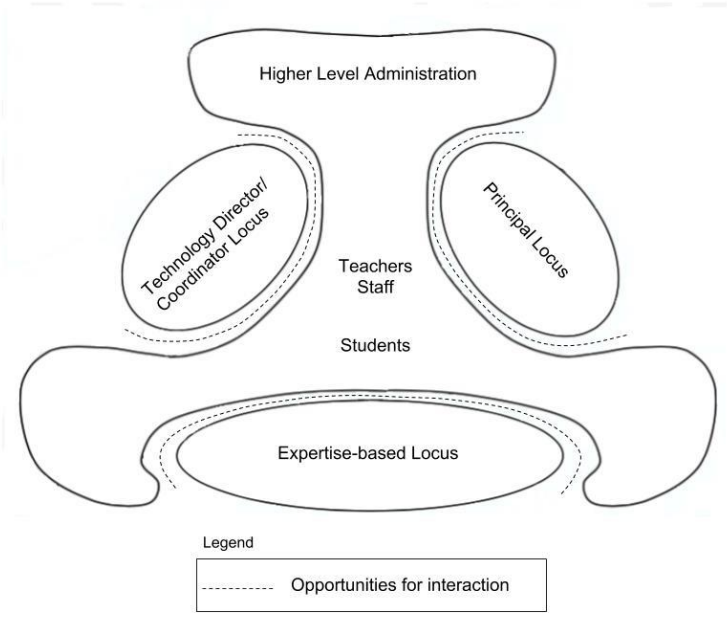

Figure 5.5. Mintzberg Map for Technology Leadership.

staff from within the loci. As I will show in the section on communication, this overlapping of access to the teachers was not as effective as it could have been in any of the cases.

This view of loci groups provided a more fluid view of technology leadership that encompassed the formal technology director, coordinator, and principal leader roles while also taking into account the more informal expertise-based technology leader roles that were revealed by the snowball sampling in each case. The identification of the informal expertise-based technology leaders in the three cases was unexpected but made more sense when I included the Conger and Konungo (1987) definition of power and authority. There was little indication in the literature that a guidance director or curriculum coordinator would be seen as a technology leader, but when the importance of the student information system in day-to-day school operations is understood, it is easy to view those who are expert in it as technology leaders. In a similar way, other technology leaders are identified by teachers and staff in the schools; the teachers and staff get to know and trust the people who know what they are doing in some aspect of technology, and, therefore, view those individuals as technology leaders.

With the new conceptual model identifying the three loci groups, I revisited the data to see how the new model would help me understand the technology situations I was seeing across the cases. A key understanding about the three loci is that they operate independently yet have overlapping authority, so there was usually a variety of viewpoints and expectations about technology that had to be negotiated concerning many issues. In the next two sections, I will describe how viewing technology leadership as loci groups can help to explain the decision-making process and the nature of communication in each case.

Decision-making and the Loci Groups

Decisions regarding technology matters were different across the cases, and sometimes the decisions that were made and the process that was used in making the decisions constituted a source of contention among the three loci groups. Ultimately, large decisions were driven by a bottom line—the basis for a finding on decision-making. Before stating the finding, I want to provide my analysis of how decisions were made via the conceptual view of the three loci groups.

Decision-making on technology across the cases. Starting with Big Valley, it appeared that technology decisions began with the technology director/coordinator loci and principal loci, Marge and Philip, respectively, discussing potential decisions and trying to include teachers and staff if the conditions of the decision permitted. For the most part, the experts at Big Valley, Joan and Susan, deferred to Marge and Philip, and were able to give some input when a decision was run by the administrator team. Joan in fact said that "Marge doesn't make decisions without having somebody else as a sounding board."

At Grand View, decisions related to technology were made in a slightly different fashion, as it appeared that technology leaders from each of the three loci were involved in most decisions. Jeffrey, the technology coordinator, considered himself the "highest official" regarding technology in the district, but reached out to Angela, the principal, and Robert, the technology integrator, when making decisions. Jeffrey was adamant, however, that he did not make the final decisions on technology, as he "was not an administrator" and said that making decisions to defend the technology budget was Angela's responsibility. The assistant principal entirely deferred to the other three technology leaders on decisions.

At Broad River, the assistant superintendent, Jennifer, was the de facto leader of the technology director/coordinator locus. Jennifer made it quite clear that she made the decisions regarding the technology budget and that the fiscal impact on the budget was her primary concern when making a decision. Jennifer did reach out to the principal about technology decisions, but only for input; she did not say whether she reached out to any of the other technology leaders when making a decision Chad, Nicole, and Amber also mentioned they were not asked for input on decisions, and it in fact upset them that Jennifer made decisions without consulting with any of them or even running a decision by the technology committee.

Conceptually, each case handled technology decisions in slightly different manners in the light of how the power and authority were used. At Big Valley, the technology director and principal were comfortable sharing decisions together and preferred to get teacher and staff input, while at Grand View, the technology coordinator deferred decision-making power to the principal. At Broad River, the assistant superintendent made the decision with the advice of the principal and admitted decisions were not shared or deferred.

Analysis of a Common Decision Across the Cases

A key piece of the finding of the conceptual model of loci leadership is that the three loci act independently but can choose to work with another locus if time or situation permits. As I have shown, in two of the cases, it appeared that including other loci in decisions was preferred. However, I had the fortune of collecting my data while a major decision was being considered by all three case sites, and this situation afforded a look at the thought process and pressures influencing how decisions on technology are made.

All three case sites participated in the Maine Learning Technology Initiative (MLTI) program, which was begun by the Maine Department of Education (MDOE) in 2002 to provide

laptops to seventh- and eighth-grade students and about half of the high school students in Maine (Silvernail & Gritter, 2007). During the summer in which I conducted interviews, the MDOE had initiated a refresh of the MLTI devices at all school districts in Maine, and all three cases had to decide whether to stay with the devices they were currently using or switch to a different device. The decision also had to be made within a few weeks, so the decision-makers in each case needed to make a quick assessment of the options given in order to make an informed decision. Even though the purpose of my study was not to study the MLTI program, the timing of my study allowed me to examine the decision-making regarding the MLTI devices in each case.

Big Valley. At Big Valley, the school was using iPads, which had been the cheaper alternative in the previous refresh three years earlier. The science teacher, April, remarked that the decision was not a popular one at the time, stating that most of the teaching staff was not in favor of using iPads; moreover, Philip said that management issues had caused frustration for parents, students, and teachers due to the lack of controls on the iPads. In the new refresh, however, the laptops were going to be same cost as the iPads (MDOE, 2016), but since there were changes impending for the iPads used in classroom management, April thought the teaching staff might elect not to switch back to laptops.

Even with the cost and management issues resolved, other factors were at play in the decision. Marge remarked that the information that was coming in rapidly had been disjointed, while the short time frame made it challenging for her to work the decision through the teachers, administrative team, school board, and back to the state. Marge believed she only had time to give a heads-up to the teachers at the March or April staff meeting to inform teachers about the choices.

Philip had a slightly different view on the decision. When asked if a technology committee was involved in the decision, he said, "[N]ot this time around" because "both Marge and I were thinking that if we give that committee the authority and then the wrong decision is made for the wrong reasons it would be really weird to override that." Philip said the final decision would be an administrative one in the end.

Grand View. At Grand View, the school had chosen to use iPads three years prior not so much for the cost savings as for the potential of the iPads to transform learning. Jeffrey said that in that previous round the decision was made in a conversation between him, the principal, and the tech integrator, but he said there were team meetings for teaching staff input. Jeffrey did say the final decision rested with the school administration and not with him or the teaching staff. Concerning the refresh, the principal, Angela, said, "[W]e knew iPads were the choice, but I would say that that decision lied primarily with myself, my tech director, and my tech integration teacher." She added that the decision was discussed among staff, but no formal vote was taken.

For Angela, staying with the iPads was the right decision, as it fit the school's philosophy of creating and producing with content instead of consuming. The technology integrator, Robert, saw the iPad as "a transformational tool in education" because the iPad was portable and allowed the students to create multimedia projects and engage with kinesthetically with their learning. Robert believed the school needed "disruptive change" and that using iPads forced teachers to deepen interaction within the classroom. Robert noted that many schools were going back to MacBooks, but his school was staying with iPads. Robert said that the technology coordinator and the principal agreed that the school needed to continue to innovate and that the school could not take that step back; therefore, they had to "fully commit to" using iPads.

The technology coordinator, Jeffrey, said the school was having a hard time getting buy-in from the teaching staff on using of iPads and wanted to let teaching staff have a voice in the decision and let their voices be heard; however, he admitted that those opinions would not affect the decision. He admitted it did sound as if there was "an authoritarian thing going on" but said that "it's a Henry Ford" kind of thing. By this he meant that if you ask people what they want they will tell you they want a faster horse instead of a car—i.e., they want the same thing they had, only with small improvements, rather than a new thing for the same use. He believed that he, Angela, and Robert needed to come up with a long-term plan in which everybody bought into to what was decided going forward.

Broad River. At Broad River, the assistant superintendent, Jennifer, had made the decision to go with iPads three years before because there was no local cost to the district when making that choice. Chad said of the decision that the iPad "wasn't anyone's first choice" and that he "wasn't in on any... meeting," but that three years later the students were saying, "I hate this thing, can we have the laptop back?" For the refresh, Jennifer made the decision to go back to laptops instead of iPads, as the move back to laptops would not affect the budget. The principal, Steven, was fine with either iPads or laptops, but the other technology leaders—Chad, Amber, and Nicole—expressed relief that their complaints about the iPads had been heard and that the school would be receiving laptops. Nicole did mention that the technology committee was not convened about the refresh decision, possibly because the decision "was made during April break so that may have been why the committee wasn't brought together." Of the decision, she said she thought "they made [the] right one, so I don't mind that."

Analysis of the MLTI Decision

In analyzing this decision in each case, one constant across the cases, though reached at by different means, was the belief that the MLTI refresh decision was an administrative-level decision. At Big Valley, Marge felt pressure owing to the short time frame and did not think there was enough time truly to involve the teaching staff in that decision. Philip, the principal, did not want to involve the teachers and staff, as he did not want them to make the "wrong" decision, the implication being that the teaching staff would not be mindful of all of the constraints on the decision, such as the cost. At Big Valley, it appeared to me that both Marge and Philip were partners in making the decision, and that the other technology leaders, Joan and Susan, might have had some say in the decision, as they were part of the administrative team for the school. There was no evidence of that in the data, however. At Broad River, Jennifer made the MLTI refresh decision herself and based the decision on cost. Even though the other technology leaders—Chad, Nicole, and Amber—were happy about the decision to go with laptops, I do not believe their lobbying for laptops had an effect on the final decision, especially when the principal, Steven, did not care which device was chosen. At Grand View, the principal, technology coordinator, and technology integrator made the MLTI refresh decision on philosophical grounds, as they were interested in pushing their vision of learning forward despite what the teaching staff thought.

Trying to understand why the technology leaders made the decisions they did led me to a finding that the economic conditions of a school district can be a major factor driving decision-making on technology. At Big Valley and Broad River, the current decision and the decision three years prior to use iPads were primarily based on the economics of the overtasked and under-resourced districts. Even though the laptop price came down to match the iPad price at the

time of the interviews, the technology leaders reserved the right to make the decision in order to prevent the making of the "wrong" decision. In contrast, at Grand View the cost of the devices was not an object, so at both times, three years prior and at the time of my study, the technology leaders focused on purchasing the devices they believed would be the best for student learning.

Economic pressures on schools. The decision-making on the MLTI refresh was also an example of how the economic pressures influenced the inclusion of loci groups in a decision. In each case, a different loci group or groups reserved the right to make the decision based on how the power and authority were understood and allocated. At Big Valley, this right was reserved by the technology director and principal, while at Broad River it was the assistant superintendent. These were the technology leaders who also minded the budget and needed to make a technology solution fit the budget first. At Grand View, this right was reserved by one technology leader from each of the three loci, as the budget was a non-issue and teaching was the central concern; therefore, the technology integrator had an equal say in the technology selection.

A final point that I will discuss more fully in a later section is how the decision-making loci in the cases did not fully include the teaching staff in the MLTI refresh decision or in the decision three years prior. I suggest that failure to include the teachers is part of a larger issue in which teachers are not made full partners in leading the use of technology in the cases. In the next section, I will present my analysis of the nature of communication among the technology leaders, teachers, and staff in the schools.

The Nature of Communication

One of the challenges in examining technology leadership is that there are many conversations happening among many different people. In Figures 5.1 through 5.3, I noted that two types of interactions were common among the technology leaders, teachers, and staff: there

were interactions of a *technical* nature and interactions of an instructional nature. These interactions are depicted by arrows showing the two different interaction patterns. Figure 5.5 illustrates not only how the technology leaders interacted with themselves but also how they interacted with the teachers and staff in a school or district.

For everyday operations, the principal loci and technology director/coordinator loci communicated regularly about topics such as the student information system, the use of organization tools, and the pedagogy of using technology for student learning. There were also discussions on the budget and the types of devices that the school or district used, the student information system, and organizational technologies such as email. Sometimes, the principals talked with the technology coordinator to get help with a technology issue or talked with the technology technician for help with troubleshooting a technology issue.

The principal loci and technology director/coordinator loci also talked with the teachers about the student information system and helped teachers in using workflow tools to boost productivity and talked with teachers about the use of technology for learning. Philip at Big Valley specifically mentioned working with his teachers in using technology and explained that he tried to help his teachers "take the next step" when he got "a chance to talk about technology for learning." Likewise, Angela also said she talked with teachers about "instructional domain" items and asked her teachers if they were using technology in ways "that['re] actually enhancing learning."

For the technology leaders in the other technology leader loci, the communications and interactions were mostly of a technical nature and were usually about the support and troubleshooting of technology issues. For example, Joan, as the guidance director for Big Valley, mentioned that she talked with Marge, Susan, and the other administrators mostly about the

student information system. Joan said she sometimes gave feedback to staff on how students were using technology devices in classroom, but that was because she happened to be out in the classrooms and offered to help. This pattern was also seen at Broad River between Chad, Nicole, and Amber, and at Grand View with Rodney the assistant principal.

The common pattern among all of the interactions and communications was that they were conducted in an *informal* manner. Many of the interactions happened in hallways as a technology leader was going through a building; others took place in classrooms or offices. The principals all mentioned talking with their teachers about the specific use of a technology for student learning, but none of them said that these interactions were part of the process by which teachers evaluated technology. The interactions also appeared to be technical in nature, even in the cases of the instructional interactions between the principals and teachers about technology for student learning. The focus of the conversations was either about how to use the technology or to see if the technology helped the students make gains in learning.

The data presented in the previous section on decision-making, indicating that the teaching staff at Big Valley and Broad River were not pleased with the choice of the iPad as the student device, and that the teaching staff at Grand View has been "dragging their feet" in adapting to the use of the iPads, suggests that asking teachers for their input is one instance in which a more formal communication process with teachers would have been beneficial. There was a common element among the cases: Each district had formal technology committees, but none of the committees had met in year or two at the time of the interviews. I will again suggest that this lack of a formal mechanism for getting teacher input, in conjunction with the non-use of the technology committee, is a symptom of the finding from the cases that teachers are not full partners in leading the use of technology. There is one more area of analysis I want to present

prior to examining the finding about teachers not being full partners. This is the analysis of the values and beliefs of the technology leaders. This analysis will provide the final element of context for my last finding.

The Values and Beliefs of the Technology Leaders

Another component of my study was to examine the values and beliefs of the technology leaders related to technology. During the interview process, I asked the technology leaders what technologies they used at work and at home and asked what value this technology had for them in each context. From this data, I was able to find three common values across the cases. Technology leaders value the use of technology as an aide to organization and efficiency, as an equalizer and enabler for students, and as a means for allowing innovative learning practices for students. In the next few paragraphs, I will provide a quick summary of these values and then show evidence from that data that these values may not be shared by the teaching staff in the cases above.

Technology as an Aid to Organization and Efficiency

The technology leaders valued the use of technology as an aide to organization and efficiency for teachers, staff, and students. Almost every technology leader believed that technology helped them do their job more efficiently. At Big Valley, Joan, the guidance director, said that technology made the "job a little easier," and with "a little less paperwork." Susan, the curriculum coordinator, said technology made her more efficient at her job, and said that "if technology can do it faster then I want it, I want us to be using it to do that so that we're not wasting time." At Broad River, the assistant superintendent, Jennifer, said technology made everyone's "jobs easier and more streamlined," while at Grand View the principal, Angela, said technology helped "make the world a little more efficient."

Ease of communication was also valued by the technology leaders. Jennifer at Broad River valued how technology allowed her to "communicate with staff" and work with them remotely on the curriculum using Google Drive. Angela at Grand View valued that technology helped her to foster "positive communication" with parents. I believe Jeffrey, the technology coordinator there, summarized how most of the technology leaders believed that technology helped them in their daily work when he said that the technology systems allowed him to stay "organized," thereby allowing him to "focus in other areas."

For students, the two teachers I interviewed valued how technology helped students stay organized. At Big Valley, April, the science teacher, saw technology as "using the newest digital tools at our... fingertips to enhance the curriculum and the lessons that we are doing" and also talked about how the new technology tools "eliminated the fact that [students] lost the papers all the time." She said that with technology the students could not lose their assignments and work because there was a copy in the eBackpack program—making it a "game changer." Melissa, the teacher at Broad River, valued the way technology helped students turn in homework, as there was "no question" that homework was in. Melissa liked that Google Classroom allowed her to eliminate "the paper flow" and made grading papers easier at home, as it was "all electronic at this point."

Technology as an Equalizer and Enabler for Students

The second value I found across the cases was that technology was seen as an equalizer and enabler for students, providing opportunities for students who had traditionally been at a disadvantage in a standard classroom setting, and giving students a with a personalized learning experience. At Big Valley, Marge believed that bringing each student one-to-one with a device allowed him or her to personalize the device for his or her own instructional needs, such as

changing the font size on a screen or activating hearing impaired features such as having the screen flash. Marge also believed that technology gave opportunities to students who lived "out in the sticks," as she believed students did not get exposed too much other than what they see on television in her district. Marge believed that students who were not exposed to technology in school would be lost and unemployable outside of school, and believed it was important to give those kids opportunities to have access to resources that were not normally given to them. Joan valued that special needs students could use devices to personalize the use of hand-eye coordination and speech-to-text tools as "huge for them." This level of personalization was not mentioned at Broad River. At Broad River, Steven saw the use of technology for learning as "very much student-driven," with the students becoming their own advocates for technology integration. Jennifer also valued the ability of technology to allow students to explore things that they were interested in, which broadened student learning opportunities. For teachers, Jennifer did say that technology allowed teachers to push out content in different ways, helping teachers reach students with different modalities as "opposed to just lecturing."

Technology as an Aid for Fostering Innovation

A third value from the cases was a belief that technology helped foster innovative teaching practices for students. In two out of the three case study sites, technology was seen as the "new and upcoming" way for the school to do "new ways of doing things and new ideas," as Nicole at Broad River put it. The teacher at Broad River, Melissa, also said that her iPad Mini was her "best friend" that she carried "around my classroom" every day, and added that "if they were going to tell me tomorrow that they were going to take all technology away, I would say, OK, but you've got two weeks and I need to have it back again."

The technology leaders at Grand View brought up the transformational aspects that

innovation using technology could provide for student learning. Angela liked that technology allowed students to "create things and produce things in a different modality," and that the "video aspects" of technology were "really compelling to the kids," as the kids are "the reality TV generation; they love that stuff." Jeffrey believed that the technology helped students "take it to the next level." To Jeffrey, the next level affirmatively answers the questions of "can they do things with communication, can they do things with collaboration... do they have access to resources or to outlets that they previously did not have... in that classroom space?" Robert saw technology as being able to allow students "to be able to play and learn and do it socially and do it independently and do it autonomously and teach me stuff and just be part of" the learning experience. Robert also saw the iPad as a "transformational tool" as it was portable, allowed students to view multimedia, and facilitated their engagement "with things kinesthetically." He believed the technology put the school "in a good space [of] now [being] able to do some really cool things"

Finally, Angela believed technology helped students to be more fully engaged in learning, saying that students "have an inclination towards technology because they're exposed to it so young and so frequently." Ironically, Jeffrey said that "one of the things that I think was too often considered" with technology was the "engagement factor," saying the engagement factor "was a bit overstated," as "it's not a natural consequence of using an iPad that that makes an activity more engaging."

Disconnect Between the Technology Leader's Values and Beliefs and Those of the Teaching Staff

Reading through these comments, it is clear the technology leaders across the cases value the technology they use and believe in the use of technology for student learning. In the data,

however, there were indications that the values and beliefs shared by the technology leaders were not completely shared by the teaching staff in their districts. At Big Valley, the principal, Philip, indicated he was aware that a deeper conversation about and training in the use of technology for learning was needed. "You could ask all my teachers as to what's difference between substitution and augmentation and I'm not sure they would understand that," he said. Philip also wondered if his school was "looking for the wrong things... because... I don't think technology makes somebody smarter on a math test." He believed there were enough applications available to support good teaching and thought by now they would be seeing "higher things happening" with student learning. Nonetheless, Philip believed that technology had an "incredible" value but thought that the value could be much higher if they could "figure out a way to... bring in the technology to deliver the curriculum."

This sentiment was echoed by other technology leaders. At Big Valley, the guidance director, Joan, believed that technology "would be a huge asset if it was used to its original purposes and to its full intent," as she saw evidence of students not using technology appropriately in classrooms (e.g., watching videos instead of doing class work). This view was echoed by Chad at Broad River. The principal at Broad River, Steven, wondered if some of the students may not be using the technology as fully as possible because they saw the iPads as "a gaming piece"; he hoped the move to MacBooks would change that perception in the coming school year. At Grand View, the technology coordinator, Jeffrey, said that teachers were "very basically scratching the level of what [their] students are capable of doing in the classroom." He thought teachers were "staying in their comfort zone" and were only "asking students to do the things that they've now learned the students can do with the device" but were not pushing the students to do anything different.

I believe this disconnect between the technology leader's values and beliefs and the values and beliefs of the teaching staff exists as a result of the administrative-level decision-making about the technology being used by the teachers at all three case sites. As I described earlier in this section, at Big Valley and Broad River, the decision to move to iPads as the MLTI student device was not seen in a positive light by some teachers, while at Grand View some of the teaching staff was reluctant to fully utilize the iPads in their teaching. I also believe this disconnect continues as the teacher's issues are not being adequately addressed owing to the informal nature of communication between the technology leaders and teachers. Finally, two out of the three values stated appear to be related more toward organizing and creating opportunities for student learning than using technology as learning devices. In the next section, I will show how these disconnects are part of teachers not being full partners in leading the use of technology for student learning.

The Mobilization of Stakeholders to Influence Student Outcomes Positively

The final aspect of my study was to examine the extent to which technology leaders believed they mobilized stakeholders in using technology to influence student outcomes positively. This analysis sought to explore how the technology leader's values and beliefs translated into actual efforts at helping teachers use technology for enhancing student learning. I do want to note that exploring how the teachers actually interacted with the students was not a part of this study. The focus of this study was to gather data on those individuals identified as technology leaders; therefore, my questioning for this section was limited to the technology leaders. To that end, I relied on the conceptual framework of adaptive leadership from Heifetz (1994) for the analysis.

Briefly, adaptive leadership concerns the work that leaders need to do in order to manage

the changes in an organization in which there are conflicts between the values, beliefs, and/or behaviors of people in the organization that causes people to resist any changes being made. Heifetz believed that most leaders attempted to address such conflicts by applying what he called "technical fixes"—e.g., bringing in an expert or providing more education to employees in order to correct the situation—to the issue (p. 73). Heifetz believed that technical fixes did not address the underlying conflict between the values and beliefs of the individuals involved, and so the issue or issues would remain despite the attempted fix. Solving a conflict in values and beliefs would instead require leaders to do adaptive work with a specific set of strategies outlined by Heifetz. These strategies included providing time for staff to make changes, encouraging staff to use their own strengths in making difficult changes, deciding on what staff needs to focus on in the midst of change, encouraging informal leaders, and choosing the decision-making process.

I suspected that some of the frustrations I had been experiencing with teachers not buying into the use of technology for student learning might be related to a disconnect in the values and beliefs between myself as the technology leader and the teaching staff I work with; in my analysis in the previous section, I uncovered just such a disconnect in the data across the cases, where statements from the technology leaders indicated that the teaching staff were not seeing "higher things happening" using technology, were just "scratching the surface" of what was possible, and were not using the technology to the "fullest extent" possible. The research question for this part of my analysis was to see what efforts, if any, were being attempted by the technology leaders to address this seeming conflict in values and beliefs. Using the strategies for adaptive work outlined in the previous paragraph as a guide, I asked the technology leaders what they did to mobilize their stakeholders, namely teachers, in using technology to enhance student learning. Of the questions asked, only two of the suggested strategies were mentioned by

technology leaders; managing the pace of change informally partnering teachers together.

Managing the Pace of Change

Across the cases, changes in technology were usually one of a number of changes to day-to-day teaching and administrative procedure that teachers and staff were being asked to manage, and the technology leaders tried to manage the pace of change if the teachers and staff felt overwhelmed. The technology leaders, who were usually part of the administrative team, worked to keep the total number of major changes for teachers and staff at any one time to three or less, one of which was usually a technology change. For example, Susan said that at Big Valley they effort was made to ensure these initiatives were as "integrated as much as possible" and to weight the initiatives against the need, "and if the technology loses for the moment it loses for the moment." Similar efforts were seen at Grand View, where, at the time of my study, both building-level and district-level changes may have been impending. Jeffrey said if the administrative team sensed "pushback" from the teaching staff, they would have an "informal discussion" with the teachers and sometimes "refocus" the priorities or maybe just "extend the timeline." Angela called it "making real adjustments" and maybe "taking something off the plate" but always trying to "facilitate a lot of discussion" about professional development.

Informally Partnering Teachers Together

The technology leaders in the case study sites knew which teachers were good with technology and actively worked to match these technology proficient teachers with the less technology-proficient teachers for help. This partnering was usually done "very informally," as Marge put it; when teachers came to her asking for help, she would say, "You know—I saw so-and-so using that in their classroom the other day, you really ought to go check that out because I can tell you the nuts and bolts and get you over this little hump but they're doing some cool stuff

in the classroom." Other evidence from the data of partnering teachers was seen from Jennifer, who said there were "go-to people in the building" that she matched up with struggling teachers. Susan said that "we just ask people to work with others" by "doing a shout out at a faculty meeting...how about sharing it with somebody else." Meanwhile, Angela said that "if a teacher's strength is project-based learning and I have this resource... who has a more flexible schedule... he can come in and say... 'We can do this.'"

Lack of a Systematic Approach to Mobilizing Stakeholders

What struck me from this analysis was that the technology leaders were listening to teachers who were struggling to adapt to using technology in the classrooms. The data from the two strategies above showed that the technology leaders were attempting to help those teachers who needed extra time and help in adapting to new technology. What also was evident in the data was that encouraging teachers and staff to use their own strengths in making difficult changes, helping decide what teachers and staff needs to focus on in the midst of change, and choosing the decision-making process were strategies that were not used in any of the cases. This observation was not surprising, as I would not expect the technology leaders to be aware of the adaptive leadership model and employ the strategies suggested. However, the data does suggest that there was no systematic process in place for becoming aware of how widespread or deep-seated a conflict in values and beliefs might be and, if needed, managing that issue. This lack of a systematic approach to addressing conflicts in values and beliefs, and thus to mobilizing teachers, is the final aspect of my finding that teachers are not full partners in a systematic process for deciding and implementing technologies for student learning. This finding, together with the previous findings that the teachers in each case were caught between three loci of leadership that only interacted informally and that the teachers did not have a systematic way of

partaking in the decision-making process for technology, provide a picture of teachers who are being asked to change the way they teach without being included in the deep conversation of how technology can or should be used in enhancing student learning.

Findings

Four summative findings emerged from this comparative case study analysis:

1. Similarities and differences in the allocation of power and authority among technology leaders may be attributed to several factors.
2. Many of the technology leaders across the cases did not lead technology in areas outside of their job duties.
3. A coherent vison of technology for student learning, equally perceived and accepted by technology leaders and teachers, is absent across the cases.
4. Technology leaders in all cases lack a strategy to mobilize stakeholders in using technology to influence student outcomes positively.

These findings will be discussed along with the implications in Chapter 6.

CHAPTER 6

CONCLUSIONS

This chapter reviews the problem statement, purpose, research design and questions guiding the study. A brief recapitulation of the limitations and trustworthiness is given, followed by the statement of the findings and discussion. In the discussion, the four major findings from the study are presented. Following the discussion are the implications for theory, future research, and practice.

The problem addressed in this comparative case study was that the promise of technology for making inroads into teaching and learning positively to influence student outcomes was being hampered by a lack of understanding as to who is actually leading technology in public schools and differences in beliefs about the value of technology for teaching and learning among by different technology leaders. Many K-12 schools used technology merely for drill and practice programs and watching videos rather than for hands-on projects (Boser, 2013). Additionally, innovation among schools' use of technology was not translating into higher standardized test scores, which many states use to gauge student achievement (Feinberg, 2017; Richtel, 2011).

School leaders were at the center of the shift toward using technology for student learning (McLeod & Richardson, 2011), but many school leaders lacked an understanding of how students should be using technology for learning in the classroom (Esplin, Stewart, & Thurston, 2018; Polney, 2018). Research on technology leadership indicated that principals should be technology leaders (Anderson & Dexter, 2005; Brockmeier et al., 2005). Technology coordinators were also identified as technology leaders (Sugar & Holloman, 2009). Identifying who should be leading the use of technology for instruction in schools and defining how they should be leading was an understudied area (McLeod & Richardson, 2011; Richardson et at,

2012). In the context of this dissertation, *technology leadership* is defined as *the budgeting, implementation, and maintenance of computers and other technologies for the classroom and the organizational decisions, policies, and actions that promote the effective utilization of technology for student learning* (Anderson & Dexter, 2005; Lesisko, 2005; Moursund, 1992).

The school's vision of technology use was also viewed as influencing the use of technology (Dexter, 2011), but many leaders did not have a clear enough vision of technology use in the classroom effectively to lead technology integration in their schools (Persaud, 2006; Polney, 2018). Additionally, it was seen that even having sufficient technology in teachers' hands did not by itself change teachers' attitudes or practice (Windschitl & Sahl, 2002), suggesting that the values and beliefs about how technology was used for student learning constituted an important factor. The differing beliefs on the need for technology use, and the reluctance to lead such efforts resulted in frustrated teachers and technology staff (Wang, 2010). Thus, more research was needed in identifying both who should be leading technology and the values and beliefs about the use of technology for teaching and learning held by these technology leaders.

The purpose of this qualitative multi-case study was to describe and understand the nature of technology leadership in three Maine public school districts and explore the values and beliefs of technology leaders in those schools. Three research questions guided this study:

1. What are the roles and responsibilities of technology leaders in three Maine public school districts?
    a) How are technology leadership responsibilities shared and distributed amongst the technology leaders and/or other teachers and staff?

b) What is the nature of communication and interaction between technology leaders and other teachers and staff?

2. What are the values and beliefs of the technology leaders concerning the use of technology?
    a) What are the technology leader's beliefs about the use of technology in instructional practices?
    b) What are the technology leaders' beliefs about the student's use of technology for enhancing learning?
3. How do technology leaders mobilize stakeholders in using technology to positively influence student outcomes?

A qualitative methodology was chosen as it was best suited for exploring the interactions among participants, the context in which the participants operate, and the processes by which these events and actions take place (Maxwell, 2005). Within the framework of qualitative research, a case study design was chosen, as there was a need for general understanding or insight into the technology leadership in school districts (Stake, 1995). As technology leadership could vary from district to district (Dexter, 2011), a multiple case design was chosen (Creswell, 2011) to allow for both an integrative and emergent approach for data analysis and the comparison and contrasting of data between cases (Bogdan, 1982). Snowball sampling was used for participant sampling as the method is especially suited for finding participants of a “hidden population” (Heckathorn, 2011, p. 356). As the participants of a technology leadership configuration may have been informal, and thus unidentified, the snowball sampling method was used to identify any potentially hidden participants for inclusion in data collection.

Data collection consisted of interviews and documents. The use of semi-structured interview questions allowed for open-ended questions that had a specific intent (McMillan & Schumacher, 2009) while also adding structure to the data for use in the comparative analysis (Guest, Namey, & Mitchell, 2012). Document collection consisted of an analysis of the school districts' websites and technology plans. Data analysis followed the strategies outlined by Maxwell (2005) for analyzing qualitative data. Cross-case analysis, informed by the research questions guiding this study, provided the comparison and contrasting of data between cases (Bogdan, 1982). Cross-case analysis was used to highlight the similarities and differences between sites to aid in preventing premature or false conclusions by looking at the data in divergent ways (Eisenhardt, 1989).

Limitations and Trustworthiness of the Study

A case study design is not generally seen as being generalizable due to the limited scope and may have restricted transferability due to the small sample size and geographic distribution. The choice of a multi-case design was an attempt to create "naturalistic generalizations" that sought to construct generalized findings from the experiences of the case study participants (Stake, 1995, p. 85). The use of the comparative case study approach was also a way to strengthen and enhance case study research by allowing comparison of the case sites horizontally through comparison of how phenomena unfold across the cases, vertically through looking at how the phenomena unfold within each case, and by tracing the phenomena across time (Bartlett, Vavrus, Bartlett, & Vavrus, 2017).

I was aware, as a technology director, that I may have introduced bias into my analysis due to my own values and beliefs. I guarded against this bias during both the data gathering process and during the analysis of the data. Interactions with the participants were conducted in

private locations where the participants worked, interviews were conducted in a friendly manner, and no videos were taken of the participants.

The site and participant selection were designed to maximize the validity and reliability of the data as typical schools. However, the small size of the school districts, with each district having under 800 students, could have limited the possible technology leadership configurations that were seen in the cases. Additionally, the artificially short time-frame in place for the MLTI decision at the time of the study may have skewed the decision-making as witnessed in the cases.

Credibility is the suggestion that the findings will be accurate and credible from the standpoint of the researcher, participants, and reader. I acknowledge that my experiences as a technology coordinator could be a liability and introduce bias into the research and interpretation of findings. I engaged in critical self-reflection throughout the process by journaling and through dialogue with professional colleagues and advisors in order to minimize my bias.

An additional limitation of the study was the decision to limit the study to the technology leaders identified by the snowball sampling process. Additional insights from upper-level administration and other teachers might have allowed for deeper analysis of the role of several of the technology leaders, especially teachers. The decision to limit the participants may have been due to my lack of training in instructional leadership. Future studies might benefit from those additional insights.

Member checking was accomplished by sending the transcripts to the participants via email in order to check the accuracy of the transcription. Only anonymized data was kept on my computer during the study. The key linking the participants' names to the data will be destroyed after data analysis is complete, and all data will be destroyed after five years. Also, triangulation

of data sources and methods was employed where possible to guard against my own bias in interpreting the data.

Findings and Discussion

This section presents the findings based on the comparative case analysis and is organized according to the research questions, analytic insights, and themes that emerged during the data collection and analysis. Case studies developed from the qualitative analysis of semi-structured interviews were reported in Chapter 4. The qualitative analysis provided a description of the roles and responsibilities, values and beliefs, and mobilization efforts of technology leaders in the three cases. Fifteen technology leaders across the three case sites were identified through the snowball sampling process. Analysis revealed the following four summative findings which I will discuss in the following sections:

1. Similarities and differences in the allocation of power and authority among technology leaders may be attributed to several factors.
2. Many of the technology leaders across the cases did not lead technology in areas outside of their job duties.
3. A coherent vison of technology for student learning, equally perceived and accepted by technology leaders and teachers, is absent across the cases.
4. Technology leaders in all cases lack a strategy to mobilize stakeholders in using technology to influence student outcomes positively.

Similarities and Differences in the Allocation of Power and Authority Among Technology Leaders May be Attributed to Several Factors

Across the cases, the roles and responsibilities of the technology leaders varied. The variances contributed to differences in how power and authority were allocated. The following

sections provide an overview of the roles and responsibilities across the cases, discusses how technology leaders approached technology leadership, and summarizes how two models of power and authority were used to explain the enactment of technology leadership seen in the cases. The final section discusses factors that influenced the allocation of power and authority among the technology leaders.

Roles, responsibilities, and decisions. The roles and responsibilities of the technology director, technology coordinator, and acting technology coordinator were similar in many ways. At Big Valley, Marge was in the role of technology director, and at Grand View, Jeffrey was in the role of technology coordinator. Both Marge and Jeffrey created and managed the technology budget, maintained and upgraded systems, worked with teachers and staff on using technology, and provided professional development; they also had a vision for technology integration, had technical backgrounds, and were able to assess and manage the effectiveness of the technology being used as seen by Sugar and Holloman (2009).

At Broad River, there was no formal technology director or coordinator, and the acting technology coordinator, Jennifer, had a few similar responsibilities with Marge and Jeffrey. Jennifer was responsible for developing the technology budget, working with teachers and staff on implementing technology, and helping to arrange for professional development involving technology. Jennifer was not involved in day-to-day technology operations, did not have a technical background, and was not involved in maintaining or upgrading equipment; Stephen and Chad, the principal and technology technician, assumed those responsibilities.

The three principals across the cases had similar technology responsibilities. Principals talked with the technology director or coordinators about what technologies the school should use but were not actively involved in creating or managing the technology budget. The principals

helped to facilitate the integration of technology into teaching and learning (Brockmeier, et al., 2005; Grady & Gosmire, 2007), helped teachers use the student information system, and used technology daily to model commitment to using technology (Brockmeier, et al., 2005). All of the principals were involved in arranging professional development for their teachers and staff on using technology. Unlike the principals, the only assistant principal, who was at Grand View, was responsible for discipline at this school and used the student information system and calendar program for his duties. He did not have any day-to-day responsibilities related to technology. In the past, he had helped provide training on a new software package and helped teachers use the calendar program, but that was the extent of his involvement in leading technology.

Big Valley was the only case in which the guidance director and curriculum coordinator were identified as technology leaders. These positions had minimal leadership responsibilities related to technology. The only apparent link to technology leadership for the guidance director was her use and knowledge of the student information system. She was able to have input on technology matters through the administrative team, of which she was a member, but otherwise was not involved in budgeting, maintenance, examining new technologies, or any other aspect. The curriculum coordinator, who had an extensive background in technology, did talk with the technology director about technology use in the classroom but chose to leave the technology leadership responsibilities to the technology director. Why this is so will be examined in the next finding presented below. Otherwise, she did work with teachers in using technology for learning and assisted with professional development on occasion.

Broad River was the only case that identified the technology technician and library educational technician as technology leaders. Each of these positions had responsibilities related

to the upkeep and management of the network and devices. The technology technician managed the network and worked on maintaining devices with the library educational technician. He also worked with teachers and students in the classrooms in troubleshooting issues. The library technician was responsible for library-related duties and worked with teachers on accessing resources online (Balas, 2001); she also worked with teachers and students on troubleshooting issues.

Four teachers were identified as technology leaders in the cases. The science teacher at Big Valley, the technology/business teacher and seventh/eighth grade teachers at Broad River, and the technology integrator at Grand View. The teachers had their teaching responsibilities in different subject areas and used technology for taking attendance and grades, and for instructional purposes, as when using a projector as an instructional aid. The teachers were seen as informal leaders, a concept from Flanagan and Jacobsen (2003), and were active in helping teachers use technology in their schools and departments. The teachers also used technology extensively in their classrooms for organizing student work, teaching, and helping students use technology for learning. The teachers were not otherwise involved with the more formal aspects of technology leadership, exception for the technology integrator. Robert was the sounding board for the technology coordinator on deciding on new technologies and worked with teachers on using technology for learning in new ways.

This overview of the roles and responsibilities across the cases showed that most of the technology leadership activities were enacted by the technology director at Big Valley and technology coordinator at Grand View. The acting technology coordinator at Broad River did a few of the activities but the principal and technology technician covered the remaining responsibilities in this school district. The other technology leaders in the cases, including the

principals, had responsibilities related to their respective jobs. Decisions were made in accordance with this allocation of roles and responsibilities. At Big Valley, the technology director made the technology decisions but did ask for input from the principal and administrative team. Sometimes the teachers at Big Valley were asked for input on a decision but a history of turning against a decision they initially supported limited that practice. Philip, the principal, also spoke of using the ABCD decision-making model, but his use of that method was mostly related to his non-technology decisions. At Broad River, the assistant superintendent made the decisions and would ask the principal for input; if time permitted, she would ask the teaching staff for their opinion on a decision. The other technology leaders at Broad River said decisions were made without any of their input or teachers input. At Grand View, the decision-making could almost be considered shared; the technology coordinator consulted with the principal and the technology integrator on a decision but often deferred the actual decision to the principal or the administrative team. His rationale for deferring the decisions was that he was not a member of the administrative team, and so was not in a position to make a decision, and that ultimately there was no decision to be made; the choices for the technologies to be purchased and used, which were presented in the budget, constituted his decisions.

Power and authority. The enactment of technology leadership across the cases differed from the studies that suggested shared or distributed leadership among different leaders (Baylor & Ritchie, 2002; Dexter, 2007; Ho, 2006; Riel & Becker, 2008). The technology director and coordinators, being the main decision-makers, were not in the habit of working jointly with the other technology leaders to share or distribute activities or decisions. The technology director and coordinators appeared to be holding onto the authority granted to them by the formal title and would share authority or decisions with the principals when there was time to deliberate a

decision. There was little evidence that the technology leaders who were not a technology director, coordinator, or principal, or teacher were involved in shared leadership activities or decisions; these individuals were being viewed as technology leaders within their school or districts but were not active participants in the leadership.

Two ways of defining power and authority were identified as possible explanations for how technology leadership was being enacted. The first definition is from Heifetz (1994) and was called formal authority, which is a type of authority where a leader is seen as the "leader" by the designation of a formal title and position. The technology director, coordinators, and principal fit this definition. The second definition is from Conger and Konungo (1987) and was known as expertise-based power and authority. This is where a leader is recognized by members of the organization as a leader by virtue of job expertise. This definition would explain the view of guidance director, curriculum coordinator, technology technician, library aides, and teachers as technology leaders.

Taken together, the lack of shared or distributed activities or decision-making and the view of technology leaders as formal or expertise-based leaders suggested that the shared or distributed models were inadequate for describing technology leadership as enacted in the cases. The technology leaders were each acting autonomously, with each leader reserving his or her authority, while also reaching out for informal input from the other technology leaders, teachers, or staff if desired. The idea of a locus of power, seen by Gronn (2000) as power that is concentrated in one center and exercised by an individual, provided an explanation of how both formal and expertise-based leaders could be and were identified as technology leaders. In Chapter 5, three loci of power were identified and named. The technology director/coordinator locus and the principal locus were each based on formal authority as each had a formal sphere of

authority with the teachers and other technology leaders. The expertise-based locus was based on the expertise-based authority model where the technology leaders and teachers are authorities within their area of expertise among the technology leaders and teachers. An updated Mintzberg (1979) diagram from the one created in Chapter 5, shown in Figure 6.1, shows in greater detail how the three loci interact with the teachers, students, and other technology leaders in the different locus groups.

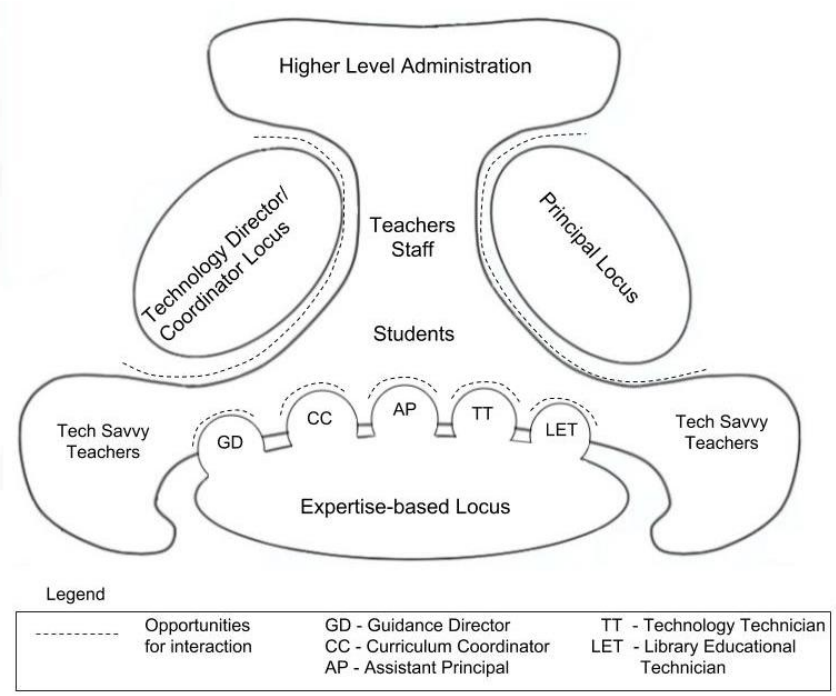

Figure 6.1. Updated Mintzberg Map for Technology Leadership.

Within each locus of power there is a mix of formal and expertise-based authority according to the strengths of each of the technology leaders. Power is centered and exercised by an individual in a locus but can be shared when desired. The individual is under no obligation to share or distribute power or authority and only does so willingly. Likewise, each locus of power is under no obligation to communicate or interact with any other locus. There is communication

and interaction between each locus, but the nature of the communication and interaction is informal and related to issues, check ins and follow ups, and getting an opinion for a potential decision.

These facets of loci leadership aided in understanding the decision-making seen in Chapter 5 in the section entitled "Analysis of a Common Decision across the Cases." Briefly summarized, the school districts were deciding on which device to choose for the Maine Learning Technology Initiative (MLTI) program. All the districts were considering iPads versus MacBooks as the option, and because the cost of these two devices were roughly equivalent, schools that had chosen the iPad previously due to cheaper cost were now considering switching back to the MacBook as the primary student device.

The loci leadership map was crucial in understand the decision-making process. One constant across the cases was the belief that the MLTI refresh decision was an administrative-level decision, however the three districts differed on how "administrative-level" was defined. At Big Valley, the technology director appeared to be sharing the decision with the principal and was not seeking any addition input. At Broad River, the decision was made by the acting technology coordinator. The principal stated he had no preference for either device, so it appeared he was comfortable not being part of the decision. At Grand View, the technology coordinator, principal, and technology integrator met to discuss the merits of each device, but in the end the decision "rested with the school administration." That means that ultimately, the technology coordinator, who was not on the administrative team, deferred the decision to the principal and possibly others in the district administration. Use of the loci leadership map aided in uncovering several factors that influenced the allocation of power and authority. These factors consisted of the economic conditions of the district, the decision to limit the stakeholders

involved in a decision, the position on or off the administrative team, the time in a position, and the lack of time for formal communications. Explanations of each of these factors follow.

Factors that influence power and authority. The lack of funding and/or lack of technology personnel can sometimes force technology leaders into decisions based on cost or time pressures. These pressures were highlighted in Big Valley and Broad River with the selection of a device for the Maine Learning Technology Initiative program discussed in Chapter 5. In Big Valley, the decision was made by the technology director and principal. No other stakeholders were involved in the decision because they felt the timeline was too short for including the other stakeholders and they were worried that the "wrong" decision might be made if the teachers were involved. The teachers were only given a "heads-up" and not involved in the decision. In Broad River, the decision on the device to purchase was solely an economic decision with teacher and staff acceptance of the devices considered a secondary condition. Since the principal would accept either of the two devices being considered, he deferred to the assistant superintendent on the decision. In both Big Valley and Broad River, the decision-making process for the device to be used by two grade levels of teachers and staff was decided by one or two individuals due to the perceived lack of time and/or funding.

In Grand View, funding was not a consideration in the decision on which device to use, but the decision to limit the stakeholders involved in a decision is itself a factor in the allocation of power and authority. In Grand View, the decision on the device to use was made by the technology coordinator, principal, and technology integrator. As in Big Valley, the decision to exclude the teaching staff was deliberate as the technology coordinator, principal, and technology integrator jointly believed the teaching staff needed to be teaching a different way and chose the device they believed would further that goal. There was an indication that some

teachers were asked their opinion, but those opinions did not appear to be a factor in the final decision. What is common among the three cases related to this factor is that the determination of who makes the decision appeared to be made by the formal authority leaders of technology director/coordinator and/or principal. The other technology leaders may have been asked to be a part of the decision, along with the teachers, but there appeared to be no obligation to do so.

A position on or off the administrative team also appeared to be a factor on the allocation of power and authority. Jeffrey, the technology coordinator at Grand View, was clear that he was not on the administrative team and thus lacked the authority to make any final decisions on what technology would be used. He helped to make decisions to build the budget but left the defense of the budget to the school board to the principal. This stood in contrast to the situation at Big Valley, where the director of technology was on the administrative team and defended the budget, and Broad River, where the acting technology coordinator was the assistant superintendent and so was responsible for presenting and defending the budget.

Length of time in a leadership position also appeared to be a factor in the allocation of power and authority. At Big Valley, the director of technology, Marge, was the acknowledged person in charge of technology by all of the technology leaders as she had been a leader in innovating with technology over the past 20 years and as a result, was highly respected. Philip, the principal at Big Valley, also had experience as a technology integrator and was eager to incorporate his vision of technology use at Big Valley. However, he felt he was too new of an employee in the district to push for his vision and did not want to “ruffle the feathers” at that time. Angela, the principal at Grand View, expressed frustration at her inability to incorporate her vision as the mechanism for creating the shared technology vision, the technology visioning committee, had been disbanded before she was hired and there were no plans to start that

committee back up. Like Philip, she believed the vision for technology use at her school needed to change but did not see a way to restart the process of reexamining the district's vision of technology use.

The final factor affecting the allocation of power and authority from this study is the lack of time for formal communications and the resulting planning, sharing, or distributing of leadership that could result. In the literature, technology directors or coordinators were seen as being time-challenged (Wang, 2010) but in this study all of the technology leaders were time challenged due to the multiple responsibilities of managing hundreds of devices, working with teachers and students on issues and training, and attending to the technology infrastructure. When coupled with local and state initiatives, the technology leaders were in constant demand by many different stakeholders in the districts. As a result, the power and authority were administered in getting the next issue resolved quickly.

In summary, the factors affecting the allocation of power and authority can aid in understanding why technology leadership is not being shared or distributed. The shared and distributed models of leadership depend upon communication and interaction among the leaders and between the followers and leaders. Across the cases, the factors just listed affected these interactions, and thus affected the allocation of power and authority. This resulted in fragmented leadership and a lack of interaction between the technology leaders and the followers. The results of this fragmentation of leadership were evident in the next finding, presented below, that many technology leaders are not leading technology in areas outside of their job duties.

Many of the Technology Leaders Across the Cases Did Not Lead Technology in Areas Outside Their Job Duties

Many of the technology leaders across the cases were not involved in technology leadership activities outside the scope of their jobs. There were leaders who possessed the knowledge to lead but chose to let other technology leaders lead. Susan, the curriculum coordinator at Big Valley was one such example. Susan had an extensive background in technology and was perceived as a technology leader due to her skill set. Susan trusted Marge, the technology director, based on their past work together and so did not feel the need to impinge on Marge's responsibilities. Rodney, the assistant principal at Grand View, was also able to stay focused on his assistant principal duties as he was "very comfortable with not being included" in leading technology. In the past Rodney had been involved in new system evaluation and training teachers on software packages but had lately become "skeptical of technology as a whole" due to the issues that social media programs created with staff, parents, students. Rodney had worked with Jeffrey for a few years and trusted Jeffrey's technology leadership abilities.

There were technology leaders who were also unwilling to lead beyond their jobs. At Broad River, Amber, the technology/business teacher, wanted to be involved in teacher training but was hesitant to make the effort. She had frequently attended professional development herself and wanted to train the staff with the new knowledge but was never given more than a few minutes at a teachers' meeting to train the teachers at her school despite repeated requests to offer such training. Amber was not involved in technology leadership activities such as budgeting and was not involved in major decisions, like the decision to move from laptops to iPads, but an inadequate budget and fallout from the iPad decision had left Amber wondering if anyone was really in charge of technology at Broad River. The technology technician at Broad

River, Chad, had also asked to be involved with new technology initiatives and system evaluations. However, he was so dissatisfied with prior decisions that were made, in which he had no input, he stopped asking to be involved in any technology leadership activities beyond his technician duties of managing the network and fixing equipment issues.

There were technology leaders who were not given the chance to lead. April, the science teacher at Big Valley, and Melissa, the grade 7 and grade 8 teacher at Broad River, were perceived as technology leaders and were involved in leadership activities in their department and grade levels. Neither teacher mentioned having any other role or responsibility. They were not aware of who made decisions, were not involved with or did not know there was a technology committee, and had no input on the budget. Even Robert, the technology integrator at Grand View, was not involved in activities such as creating the budget or being on the technology committee. Robert taught classes and worked with teachers on integrating technology, which were within his job responsibilities, but on occasion provided individual and staff professional development when asked to do so. Philip, the principal at Big Valley wanted to get more deeply involved in budgeting and wanted to set up mechanisms to encourage staff collaboration around technology. He was not given the opportunity to be involved in those ways and felt unable to broach these subjects with the technology director, Marge. He believed he was still too new in his position to raise these topics with Marge.

The three sets of examples above illustrate the different trust relationships that were seen between the technology leaders. Trust, when viewed as the willingness of someone to be vulnerable due to the expectation that they will be treated benevolently, honestly, openly, reliably, and competently, (Tschannen-Moran, 2004), was strong where there was honesty and openness between the technology leaders, as appeared to be the case with Susan and Marge at

Big Valley and Rodney and Jeffrey at Grand View. Trust was weak where there was a perceived lack of openness for sharing information and responsibilities and a belief that technology decisions were not being made in competent manner, as was seen with Amber, Chad, and Jennifer at Broad River.

A lack of trust may be also have been a factor in why the teachers and principal were not given technology leadership responsibilities at Big Valley and Broad River. The teachers may not have been observed doing technology leadership activities outside of their departments or grade levels as they may not been offered the opportunity to take on such responsibilities. Therefore, the technology leaders with the responsibilities would not necessarily trust the teachers without having worked with them previously. The same holds true concerning the principal at Big Valley, Philip. Although Philip had an extensive background in technology and had been a technology integrator at one time, he was new to the district and was hesitant to "ruffle feathers" and ask Marge for additional responsibilities. Perhaps Marge lacked trust in Philip due to the short time they worked together and was not comfortable in having Philip take on additional technology leadership responsibilities.

There is another possibility to consider for why some technology leaders were not given additional responsibilities. Roland Barth (1987) coined the term "burden of presumed competence" to suggest that leaders who are expected to lead sometimes fall into the trap of believing they need to competent in all aspects of leading in their jobs when in fact they may not be. Perhaps Jennifer, the assistant principal at Broad River, and Marge, the technology director at Big Valley, have taken on the "burden of presumed competence" and believe they need to hold on to the technology leadership responsibilities for themselves to perform. If so, they may be missing an opportunity to tap into the skills and abilities of April, Melissa, and Philip in helping

enact technology leadership in their schools or districts. A strategy for reflecting on the technology leaders' role in how their actions may be creating the conditions for inaction by some technology leaders will be recommended in the implication section. In the next section, a finding related to the values and beliefs of the technology leaders will be presented and discussed next.

A Coherent Vison of Technology for Student Learning, Equally Perceived and Accepted by Technology Leaders and Teachers, is Absent Across the Cases

This study identified three core values and beliefs from among the cases where there the emphasis on the use of technology was less focused on student learning and more focused on other factors. Technology was seen as an aide to organization and efficiency, where technology helped teachers and students keep track of assignments and schedules, do away with paper for homework, and communicate easily with others. Technology was also viewed as an equalizer and enabler for students, providing opportunities for students who had traditionally been at a disadvantage in a standard classroom setting. Technology could provide a personalized learning experience for these students by allowing modifications to the screen and by allowing the student to interact with a device in different ways.

The values of organization and efficiency and equalizing student access show that the technology leaders believed technology was useful for helping teachers and students better organize their time and work. Technology was looked on as a tool for performing functions better or in different ways than pencil and paper. Anecdotes from returning students appear to have been the basis for these beliefs and those stories were used to justify the time and expense of technology requests during budget time.

The third value was that technology was viewed as a way to help foster innovative teaching practices for students by providing "new and upcoming" ways for the schools to do

transformative and innovative learning. Technology was considered a catalyst for helping students create and produce content using different modalities and could help students take their learning "to the next level." Technology was also considered a tool that was providing new ways of creating content by teachers and students, such as being able to create and edit videos for both instructional use and for demonstrating learning. These tools were believed to engage students more deeply in learning and were used to justify expenditures for new technology. The new technologies were also seen as being valuable to graduating students who would be able to use the new skills in college or the workplace.

The difference between seeing technology as a tool and technology being used for innovation was seen by Webster (2017), who discussed two philosophical approaches to technology use. Technology could be used as a tool where educational goals and curriculum drive technology use, or changes in technology could be viewed as being inevitable and the curriculum needs to be changed to keep up with the new technology or risk falling behind. The importance of the distinction, according to Webster, lies in how each philosophical approach drives decision-making related to the technology that is purchased. Is technology purchased to serve the curriculum, or is the latest and greatest technology purchased in order to keep up with the curriculum being modified to incorporate the new technologies?

By Webster's definition, the technology leaders at Big Valley and Broad River viewed technology as a tool for use in service of the curriculum. Resistance by many teachers in changing their instructional practices to incorporate technology for student learning, as noted by the principals, suggested there was a mismatch between the values and beliefs of the resistant teachers and of the technology leaders and technology savvy teachers. It appeared the technology leaders and technology savvy teachers became excited by the potential for the new generation of

technology devices to enhance student learning and convinced the resistant teachers to give the new technology a chance. A lack of adequate teacher training and immature management software the hampered the effort which was actually a state-wide issue (MLTI, 2016). The technology savvy teachers were often able to work around the issues, such as April from Big Valley and Melissa from Broad River, but the resistant teachers reverted back to the non-technology-based teaching methods they were comfortable using. For the technology-resistant teachers, the value of using technology for learning would not outweigh the value of learning without technology.

At Grand View, the values of the technology leaders favored the philosophy of technology for innovation. In the technology plan for Grand View, there was a vision of learning adapted from the International Society for Technology in Education standards (ISTE, 2016) instead of a vision for technology use. The values and beliefs of the technology leaders in the data matched the wording in the ISTE standards; for example, critical thinking and innovative thinking are mentioned in one of the ISTE standards and were directly mentioned by the technology leaders as a reason for going with iPads in the MLTI program. Despite the vision of learning and clear standards for technology use, there were teachers who were reluctant to change their teaching habits to embrace the iPads. The issues seen in the other two case sites may have been a factor, but the makeup of the technology committee at Grand View, and comments from the technology leaders in the data, point to another possible explanation for the resistance. The technology committee at Grand View was made up of the technology coordinators and administrators of the district; no teachers were listed as authors of the technology plan. Teachers were also being told what devices they would use by the administration and technology leaders in order to effect change in teaching habits. According to Wenzel (2018), a mandated one-to-one

technology program may not be successful if the teaching staff is not allowed to give input and feedback into the decision. The lack of teacher input into the devices they were using might have fueled the resistance to change in Grand View.

A constant in each case was that the lack of teacher input in decision-making, when coupled with a lack of connection between the values and beliefs of the technology leaders and teachers, were factors that fostered resistance to the widespread use of technology for learning. The inability of the technology leaders to overcome that resistance is the topic of the final finding, discussed below.

Technology Leaders Across the Cases Lack a Strategy to Mobilize Stakeholders in Using Technology to Influence Student Outcomes Positively

The three findings thus far indicated that the technology leaders in the cases worked in environments where holding a conversation about the use of technology for student learning was challenging. Technology leaders in these rural districts seemed overworked and understaffed leading to what Donaldson has termed a culture of "busyness" (Donaldson, 2006). The technology leaders were so busy doing day to day operations, maintenance, and troubleshooting that thoughtful time for planning was hard to schedule. Technology leaders could not walk the hallways without being interrupted. As a result, communication and interactions were mainly concerned with solving problems and were informal in nature. The desire to schedule formal meetings or discussions had to compete with other priorities. Teachers, administrators, and technology leaders had limited time for scheduling meetings, and time for technology training at teacher meetings had to compete with other local or state-mandated initiatives.

In this environment, technology leaders still attempted to mobilize teachers to use technology more effectively. The technology leaders talked about how technology was provided

to teachers and students in order to create new opportunities for learning with technology, yet the technology was enthusiastically embraced by only a minority of the teaching staff. The technology leaders attempted to provide more frequent and in-depth professional development, but many of the teachers resisted changing their teaching practices to incorporate the new technology. The technology leaders attempted to manage the pace of change in order to give teachers additional time in learning new technology, delaying or even cancelling initiatives if they sensed the teachers were overwhelmed by multiple initiatives. Lastly, the technology leaders partnered up teachers informally to mentor the use of technology by having a teacher with technology experience partner with a teacher with little or no technology experience.

These efforts were not seen as generating the desired change among many of the teachers in using technology for learning. In the conceptual framework for this study, I suggested that the issue of technology not being used effectively for enhancing student outcomes might be viewed as an adaptive challenge (Heifetz, 1994). As discussed in the third finding, the resistance of teachers in the cases above to using technology for learning might be rooted in the conflict between the values and beliefs of the technology leaders and teachers. Viewed as an adaptive issue, the efforts at mobilizing teachers, shown above, would be perceived as technical fixes. However, such technical fixes would only address the symptoms of the issue but would not address the root of the problem which is the conflict between the values and beliefs. Therefore, the final finding is that technology leaders lack an overall strategy to mobilize stakeholders in using technology to positively influence student outcomes. The attempts that have been made will not work, as they are not part of a larger plan to address the conflict between the values and beliefs of the technology leaders and teachers.

Implications

This study illustrated many of the challenges facing technology leaders in helping teachers and students use technology to enhance student learning. Embedded in the findings are pathways for changing technology leadership practices to include all technology leaders, teachers, and staff fully in the leadership process. An updated conceptual framework based on the results of this study is also presented to provide the context for the implications. The following paragraphs introduce the updated conceptual framework and discuss the implications of the findings for technology leadership.

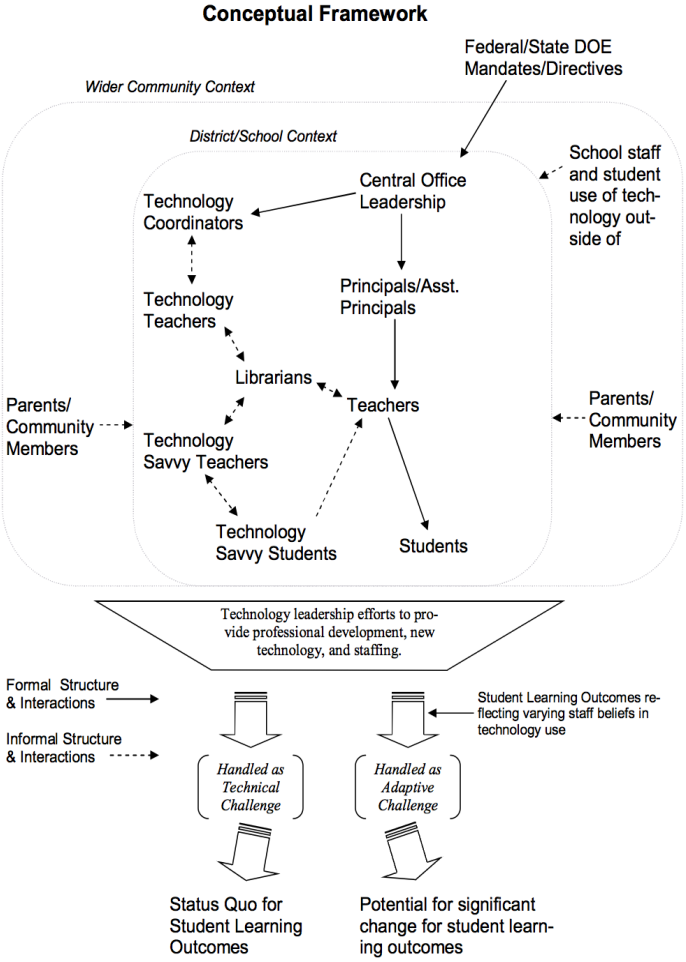

Figure 6.2. Original Conceptual Framework for Technology Leadership.

Original Conceptual Framework

The original conceptual framework for technology leadership, introduced in Chapter 2 and shown again in Figure 6.2, had technology leaders and followers together provide professional development for staff in using and maintaining technology, purchasing new technology, repairing existing technology, and maintaining staffing to aid in these efforts. Differences in the beliefs among the staff were treated as technical challenges that resulted in technology not being used to its full potential. If the differing beliefs could be identified and acted upon as adaptive challenges, then more effective use of technology for student learning would follow.

Updated Conceptual Framework

Figure 6.3 shows an updated conceptual framework based on the results of this study. There are now additional school positions included in the conceptual framework. These were the positions identified through the snowball sampling process and included the guidance director, curriculum coordinator, technology technician, and library educational technician. These were positions not mentioned in the review of technology leadership literature yet identified in the cases presented in Chapter 4 as technology leaders. They were involved in some way in implementing and maintaining computers and other technologies for the teachers and students and carrying out organizational decisions, policies, and actions involving technology. Essentially, they are people others go to get answers for questions about technology.

I believe more accurate terminology would aid technology leaders in identifying expectations for the various roles and illuminate power and authority relationships between the

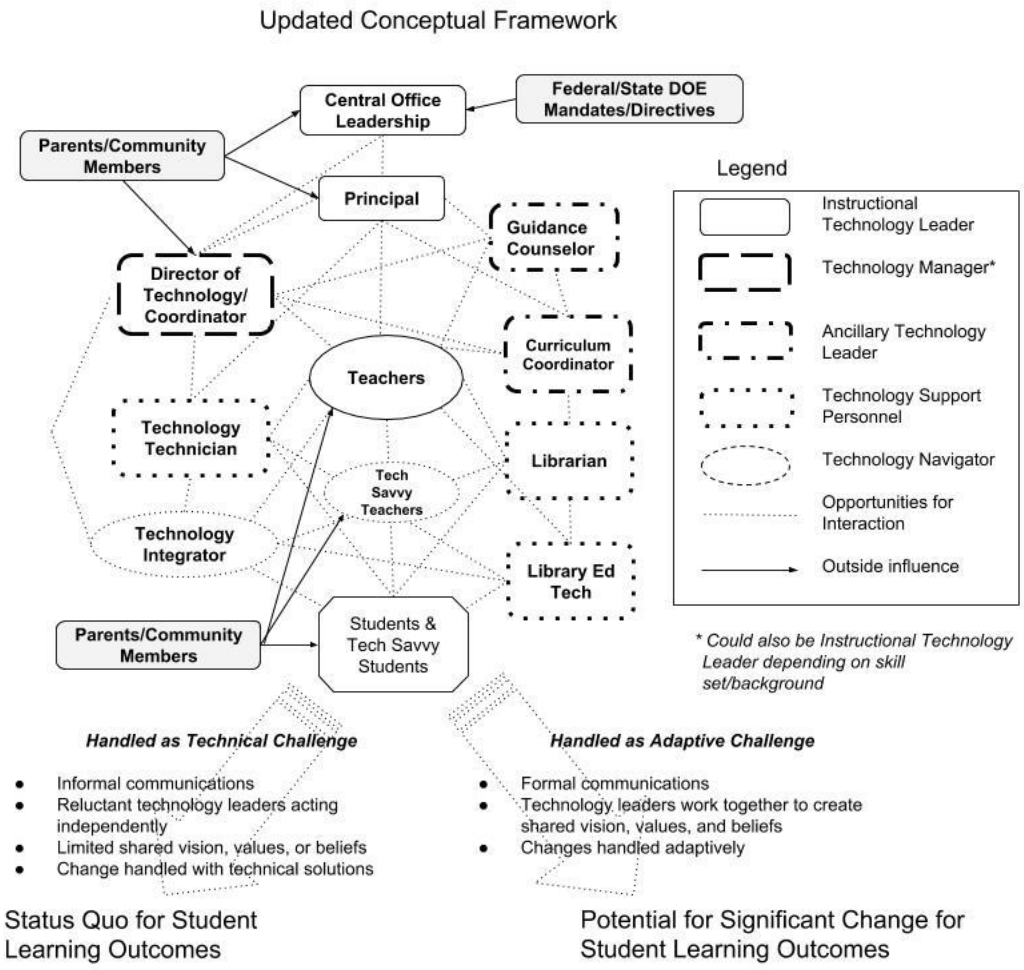

Figure 6.3. Updated Conceptual Framework for Technology Leadership.

technology leaders at a school or district. I offer the following technology leader roles based on the results of this study:

- *Technology Manager*: Leads a team of technology personnel. Creates and manages tech budget, oversees infrastructure and implements technical side of state and district technology initiatives. Has limited input on a vision for learning and has no responsibilities related to learning experiences with technology.
- *Instructional Technology Leader*: May perform duties of a technology manager but has an instructional background and is responsible for overseeing the development of

learning experiences with technology. Often is part of the administrative team for a district. Ensures technology is included in a vision of learning for the school and/or district. Includes principals owing to their input on school budgets and their instructional responsibilities related to teachers.

- *Ancillary Technology Leaders*: Uses technology as part of job responsibilities and is recognized by staff as a resource for that technology but has limited or no technology leadership responsibilities.
- *Technology Support Personnel*: Positions that have technology responsibilities, such as the technology technician, or are jobs in which supporting technology is an additional duty, such as library educational technician. Usually has limited technology leadership responsibilities or instructional background.
- *Technology Navigators* (Cain, 2015): Expands Cain's definition of technology navigators as teachers who face challenges working in innovative and blended learning environments that are both technological and pedagogical in nature. This study expands the definition to include teachers who are adept at bridging both the technical and pedagogy areas by nature of their interest and skill in using instructional learning technologies in any classroom environment.

The addition of several new technology positions into the conceptual framework multiplies the number of opportunities for interactions that can take place between the technology leaders, teachers, staff, students, upper-level administration, and parents. It also speaks to the realities of leadership in small rural school districts and the need for leaders to wear

multiple hats. With this new conceptual framework as the context, I now offer an emerging concept of technology leadership based on my analysis in this study.

A New Concept of Technology Leadership

Technology leadership is *the enactment of a shared vision for learning with technology that incorporates the values and beliefs of the technology leaders, teachers, and staff; utilizes a leadership framework in which all technology leaders can lead in an atmosphere of trust; and uses adaptive leadership strategies (Heifetz, 1994) to mobilize technology leaders, teachers, and staff to maximize the use of technology for enhancing student learning*. The shared vision for learning, leadership framework, and adaptive leadership strategies are ways the technology leaders can fully utilize the skills of the different technology leader roles identified in this study and bring focus and inclusion to technology leadership efforts. The generative implications for practice build from the useful actions and positive trust relationships that were seen across the cases. The next four sections discuss the implications for practice.

Shared vision of learning. Technology leaders need to foster a shared vision of learning with supporting technology for the school or district. Current research stresses the need for technology leaders to create a shared vision (Jackson, 2017) and suggests that providing teachers with common language and processes to plan their use of technology for learning can help teachers use technology more effectively (Hutchison & Woodward, 2018). The finding about values and beliefs suggests that teachers, in order to be invested in putting in the time and effort to embed technology into their teaching practices, need to be involved in the creation and implementation of a shared vision and be involved in deciding what technologies will be used when enacting a shared vision of learning. The two models of technology integration and pedagogy known as SAMR (Puentedura, 2013) and TPACK (Baran, Chuang, & Thompson,

2011) are only starting points for basic technology integration. In order to embed technology into teaching practices fully, a more comprehensive vision of learning using models such as the Dynamic Learning Project (DLP, 2019) or the ISTE standards for innovative learning environments (ISTE, 2016) may be helpful in creating a shared vision of learning that focuses not on the technology to be used but rather on the learning that needs to occur with the support of technology. The use of a model for learning would also provide a common language for discussion that would allow technology leaders, teachers, and other staff to describe their vision of learning in consistent ways during discussions and professional development.

Developing a shared vision of learning might also benefit from understanding and addressing the assumptions behind the values and beliefs seen in the cases. In two of the three case sites, the values and beliefs did not address directly the use of technology for student learning. Seen as a case of espoused theory (Argyris & Schon, 1992), perhaps the technology leaders were unaware of a gap between the values and beliefs they espouse, which concern technology for learning, and the values and beliefs they enact, which view technology as an aid to organization and efficiency and as an equalizer and enabler for students. Engaging the teachers in identifying a shared vision for learning could begin the process of aligning the espoused values and beliefs and the accomplished values and beliefs toward a consistent message and implementation. This engagement with teachers would also increase the efficacy of professional development efforts by aligning training with the shared vision of learning and increasing the likelihood of teacher buy-in.

Shared and distributed leadership. Shared leadership (Pearce & Conger, 2002) was viewed as a possible technology leadership model for principals and technology coordinators (Baylor & Ritchie, 2002; Sugar & Holloman, 2009) and principals, technology coordinators, and

school leaders (Benedetto, 2006). Distributed leadership (Spillane, 2006) was also seen as an effective leadership model for technology leaders (Dexter, 2007; Seong & Ho, 2012). If a school or district is not utilizing a leadership model for technology leadership, the adoption of a shared or distributed leadership model should be considered. I refrain from suggesting one model over another, as I believe the makeup of the technology leaders among the staff and the culture of the school or district should be considered when making such a choice. Schools or districts may also be aware of an alternate leadership model that might best fit their needs.

The unrealized promise of technology as a positive influence upon student outcomes (Cousins, 2016; Ferster, 2014; Weston & Bain, 2010) is made manifest in classrooms. Whichever leadership model is chosen, it is important that the leadership model fosters the creation of a shared vision of learning with technology by including technology leaders, teachers, and staff in the technology leadership and decision-making process. The leadership model should also include procedures for communication and interactions that encourage time for in-depth discussions. It is not enough to include only the technology-savvy teachers in evaluating and using new technologies; they are already adept at using technology for student learning and are usually able and willing to work through issues. It is the teachers who are less adept at using technology who will revert to non-technology methods if proper support, training, or reasons for changing their teaching practices are not provided. Including the technology-resistant teachers in the discussions and decisions related to the technology they will use, and giving proper training for the technology, are critical steps in changing teacher practices towards the use of technology.

Building trust. Building on the trust already present between some technology leaders and working to build trust when needed for other technology leaders might also spur technology leaders to engage in different technology leadership activities. There were three processes

identified by Tschannen-Moran (2004) that could foster existing trust or begin building up trust between the technology decision-makers and reluctant technology leaders. One process could be to foster openness between the technology leaders. Openness in information and the disclosing of facts, openness in control and showing confidence in others, and openness in influence to allow others to initiate change would show reluctant technology leaders that they are valued as leaders. A second process could be showing willingness in accepting staff input. Including the reluctant technology leaders in a decision and asking input on issues demonstrates that the reluctant leader's views are valued and important. A third process mentioned by Tschannen-Moran was to be honest about skill levels. Skilled technology leaders can know when someone is not competent; also, being honest in a case in which they do not know a technology skill can help foster trust that the leader is being authentic and not trying to manipulate others.

The three processes outlined here could be used by the technology decision-makers to address the trust issues seen by a few of the technology leaders in the cases. Being open with information and control would show the other technology leaders that they are trusted with knowledge or responsibilities. Listening to input from all technology leaders would show trust in the knowledge and opinions of the other leaders. Asking another technology leader to lead in situations where one's skillset is limited would demonstrate an awareness of limitations and demonstrate trust that the other leader is capable. Showing trust in these ways over time would have a positive effect with the reluctant technology leaders that would also filter down through the teachers and other technology leaders.

For the situations where the technology leaders do have trust, encouraging those leaders to lead in other ways would begin modeling the sharing of leadership with other technology leaders, teachers, and staff. This would indicate that the technology leader decision-makers are

serious about including others in decisions affecting technology. The key to establishing trust by the technology decision-makers is to step back, review how decisions are made, and seek out situations where the authority to lead can be delegated. In the next section, a framework and a set of strategies for reviewing technology leadership practices in these ways are presented.

Approaching technology leadership adaptively. The technology leaders in these cases took steps to help teachers adapt to new technologies for student learning. The previous three implications would benefit from an overarching plan that would harness those efforts and bring in teachers and other stakeholders as part of the plan. Utilizing the adaptive framework from Heifetz (1994) could provide a way of focusing the efforts already being made and encouraging the adoption of a shared set of values and beliefs related to a vision for student learning that is supported by technology. Heifetz and Linsky (2002) identified several strategies, addressed in the following paragraphs, that can help leaders to address adaptive issues.

Most importantly, technology leaders need to maintain their perspective while being in the middle of the action. This is known by Heifetz and Linsky as "getting off the dance floor and going to the balcony" (p. 51). From the balcony, technology leaders can see all of the players in motion and also the overall patterns of leadership developing and playing out amongst the stakeholders. For example, the technology leaders could observe how teachers, educational technicians, students, and higher-level administration are all reacting to a new initiative or to a change in the vision of technology use. Stepping back to see the technology practices from above would also allow the technology leaders to see how they are fitting into the action, which may prompt the use of alternate leadership strategies.

Technology leaders can also "give the work back" (Heifetz & Linsky, 2002, p. 124) or "place the work where it belongs" (p. 127) in order to allow those experiencing adaptive issues

to take ownership in the solutions. Making adaptive changes is challenging, as staff adjust their values and beliefs to a new reality, and a leader can run the risk of rebellion by trying to impose a solution onto unwilling staff. Heifetz and Linsky suggest placing the solution to the adaptive change back into the hands of the affected staff. In this way the leader can avoid being seen as solving the issue and will force staff to internalize, own, and resolve the issue to make progress.

An example of "giving the work back" would be involving all teachers and staff in deciding on the technologies that will be used by students for learning. Across the cases, the technology leaders made decisions on the technologies used by students with limited teacher and staff input. Thus, many teachers and staff did not exhibit ownership over the devices in their classroom. An adaptive way of addressing that issue might be to put the decision for which device to use completely in the hands of the teachers and staff. Getting to a decision might take some time and involve many discussions, but through the process, the values and beliefs of all teachers might culminate in a decision in which all staff could claim ownership. The decision would also need to be honored by the technology leaders and upper-level administration who would need to provide budgetary and training support for the decision.

Partnering with "those who are uncommitted" (Heifetz & Linsky, 2002, p. 75) is another strategy that technology leaders can use to build support for change. In organizations dealing with an adaptive change, allies and opponents are often easy to find as people's values and beliefs are either affirmed or challenged. As important as it is to have allies and work with opponents, sometimes it is the uncommitted who can make or break an adaptive change in an organization. For example, across the cases there were teachers embracing the use of technology for student learning, and there were teachers opposed to the idea. There were also teachers between those two extremes. The uncommitted teachers are often willing to work with

technology leaders if they feel supported and validated and their needs are addressed. Unlike the teachers who have no intention of changing, the uncommitted can be willing to change and could become formidable allies when working through an adaptive change.

Creating a "holding environment" (P.102) can be a way for leaders to manage the stress of change that is generated when tackling adaptive issues. Addressing issues related to values and beliefs can prompt a passionate response in staff, and tensions can flare up between the leaders and staff, and may need to be managed lest the passions boil over. Creating a holding environment is a way for leaders to contain the passions and allow adaptive work to continue productively. Examples of creating a holding environment are hiring an outside facilitator to work with staff, moving meetings off-site to create a neutral space, or creating spaces for minority voices to be heard and not minimized. Technology leaders might use these strategies when guiding the teachers and staff to a shared vision of learning with technology. If a significant portion of the teaching staff either does not believe in the value of technology for enhancing learning, or believes that teachers are being asked to change to new or different technologies too quickly, then technology leaders may need a holding environment to manage the discussion.

These adaptive strategies, when combined with a shared vision of learning in an atmosphere of trust in this emerging conception of technology leadership, could enable the enactment of technology leadership in a way that the entire teaching staff, and not merely the technology savvy teachers, are able to use technology to enhance student learning. The updated conceptual framework for this study highlights the different school personnel who might be tapped as technology leaders, the most important of whom are the teachers who are using technology for enhancing student learning. Future research should strive to replicate this study in

schools of different sizes and technology leadership configurations. The choice of a three Maine rural public school districts was intended to explore technology leadership in an environment with which I was familiar and about which there was a lack of research. An implication of this study that would arise from further research is that it would identify and elucidate the roles and activity of the different school personnel who are viewed as technology leaders would validate the results from this study, would suggest other personnel who might be viewed as technology leaders, or would do both.

Concluding Thoughts

This exploration of technology in three Maine public schools has increased awareness of my own practices as a technology leader. Stepping back to examine technology leadership in other districts has impressed upon me the need for cultivating a shared vision of learning that includes and honors teachers' values and beliefs about technology use. A technology director myself, I am aware of how busy everyone is in public schools. I have always attempted to share technology leadership responsibilities whenever possible, and the finding that many individuals regarded as technology leaders do not lead gave me a deeper understanding of how the other technology leaders in my district might react when asked to assume a greater leadership role. That finding also underscored the need for trust, which has always been a high priority for me.

In a multiple case study design, findings are not considered generalizable (Stake, 1995); however, the use of purposeful site selection (Yin, 2011) and snowball sampling (Noy, 2008) aided in creating generative implications from the findings (Mason, 2017). A key take-away for technology leaders is that they step above the day-to-day enactment of technology leadership activities and use the strategies outlined in the implications for practice to audit their technology leadership practices and revise them as necessary. In such an audit, the technology leaders could

see if the factors affecting the allocation of power and authority are inhibiting leadership activities and could work to minimize those factors. Technology leaders could recognize when other technology leaders are hesitant or unwilling to lead and seek to build trust with those leaders. Technology leaders could also create or adopt a vision of learning for their school and work with other technology leaders, with teachers, and with staff to enact that vision. Finally, technology leaders could use the framework of adaptive leadership (Heifetz, 1994) to enact the strategies outlined and to align the values and beliefs of technology leaders, teachers, and staff. At the end of the day, nothing is as important as helping students learn.

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APPENDIX A: SURVEY FOR SAMPLE SITE SELECTION

My name is David Fournier and I am a graduate student at the University of Maine in Educational Leadership. I am doing a study on technology leadership in Maine public schools and I have identified your school district as a possible research site. If selected, your site would be part of my dissertation on technology leadership in Maine school districts, specifically understanding the nature of technology leadership and exploring the values and beliefs of technology leaders. I would then visit your district no more than two times to interview the people who lead technology in both formal and informal roles. The data I collect would be kept confidential and names will be changed in my dissertation and references, and a pseudo-name will be given to your district to protect confidentiality.

Please either fill in this survey questions on the following page or pass along the survey for your technology coordinator or person knowledgeable about technology in your district to fill out. This survey is also accessible on-line at this link: www.xxxx.com

I thank you for your time.

Survey for Technology Leadership Research Project

I agree_____do not agree_____ to allow my district to be considered for this research project.

If you agree, please answer the following survey questions. If you do not agree, do not answer the survey questions.

Please mark if your district employs the following positions		
	Yes	No or this position does not exist in my district
Assistant Superintendent		
Curriculum Coordinator		
District Technology Coordinator		
Building Technology Coordinator(s)		
Technology teachers		
Librarians		
Other_____		
My district does_____does not_____have a technology committee or group.		
My district has a vision for technology use URL of web site:_____		
The vision for technology use is standalone or part of a vision for learning?		
Please rate the level of technology use by students in your classrooms		
⟷ Used in a few classes.....used in about half of your classes.....used in the majority of classrooms		

APPENDIX B: INFORMED CONSENT LETTER

You are invited to participate in a research project being conducted by David Fournier, a graduate student in the Department of Educational Leadership at the University of Maine. The purpose of the research is to examine the factors that influence successful technology integration efforts in Maine public schools. If you decide to participate, you will be asked to participate in an interview. Sample questions are:

- Tell me about your position in this school and district.
- Tell me what the word "technology" means to you.

While this study will have no direct benefit to you, it is hoped that the proposed study will provide valuable information in designing and offering future technology leadership training for Maine school principals and will aid in establishing effective technology leadership practices in Maine public schools.

There is no compensation for participating in this study.

Your name will not be on any of the documents. A code number will be used to protect your identity. Data will be kept in a locked office. Your name or other identifying information will not be reported in any publications. The key linking your name to the data will be destroyed after data analysis is complete, and all data will be destroyed after five years.

Participation is voluntary. If you choose to take part in this study, you may stop at any time. You may skip any questions you do not wish to answer.

If you have any questions about this study, please contact me at (924-7602) or at david.fournier@umit.maine.edu. You may also reach the faculty advisor on this study at richard_ackerman@umit.maine.edu. If you have any questions about your rights as a research participant, please contact Gayle Jones, Assistant to the University of Maine's Protection of

Human Subjects Review Board, at 581-1498 (or e-mail gayle.jones@umit.maine.edu).

Your email response for agreeing to interview will indicate that you have read and understand the above information. You will receive a copy of this form.

APPENDIX C: FIRST INTERVIEW PROTOCOL

I want to thank you for taking the time to meet me today. My name is David Fournier and I am a graduate student at the University of Maine in Educational Leadership. I am doing a study on technology leadership in Maine public schools and I would like to talk to you about your experiences concerning the use of technology in your school or district. The interview should take no more than an hour. I will be recording this session on my laptop in order to transcribe our conversation later for analysis. All responses will be confidential. Participation is voluntary and you may stop this interview at any time if you wish. You may skip any questions you do not wish to answer.

Are there any questions about what I have just explained? Are you willing to participate in this interview?

_____ _____

Interviewee signature Date

Interview Questions:

	Interview Question	Prompts	Conceptual Framework	Q1	Q2
1	Tell me about your position in this school and district.	Prompts: How long worked in current position How many years in education Other positions held either in this school/district or others	Context District/School	Q1, Q1a	
2	Tell me what the word "technology" means to you.	Prompts: Computer, laptop, personal devices, phones, software, projectors, documents cameras, dvd/vcr players, internet	Values and beliefs on technology use		Q2
3	Tell me about the technology you use daily.	Prompts: Use at home. Use at work: for administrative purposes, for teaching.	Context District/School	Q1a	
4	What do you think is the value of this technology you use related to your position? Does this differ from your technology use at home, and if so why?		Values and beliefs on technology use		Q2, Q2a
5	When you talk about technology, who is it you usually talk to?	Prompt: other teachers, tech people, administrators, parents	Context District/School	Q1b	

6	What is it you usually talk about?	Prompt: new technology, when you have problems, how to use it in the classroom	Context District/School	Q1b	
7	How and where do you usually talk to these others about technology? ◦	Prompt: face to face, email, social media, informally, in meetings.	Context District/School	Q1b	
8	In your position, what activities do you perform directly related to technology? ◦	Prompts: Budgeting, technology committee meetings, talking with tech staff/teachers/principals/ leaders about technology, reading about technology	Context District/School	Q1a	
9	Tell me what you know about the technology students use to learn at your school(s)?	Prompts: Computer labs, classroom technology, personal devices, interactive white boards, software and apps.	Values and beliefs on technology use		Q2
10	Thinking about these items in relation to your student's learning, what do you believe is the value of this technology in relation to enhancing student outcomes? Why?		Values and beliefs on technology use		Q2b

11	What influenced those beliefs on technology use for student learning?	Prompt: personal experience, observing students using tech, reading articles, conversations with other teachers	Values and beliefs on technology use		Q2b
12	Do you know what process was used in deciding on those specific technologies, and if so, what was the process used?	Prompts: Who was involved in making the decision, were you involved in making the decision, was there a committee guiding the process, was it a state or federal-driven mandate, were students included in the discussion, was the decision part of larger vision or plan.	Context District/School	Q1	
13	Teachers: Tell me about the professional development you were given to help you use the technologies effectively to enhance student learning.	Prompts: How often was it given, and duration of training. Who did the training. Was the training helpful.	Context District/School	Q1	
14	Teachers: Tell me about the support you are given to help you use the technologies effectively to enhance student	Prompts: Who supports the technology you use. How responsive is the support. How effective is the support.	Context District/School	Q1	

learning.

15	Do you believe your school district's efforts on technology are too limited, just right, or ahead of the curve, and why do think that?	Context District/School	Q2

End of interview script:

Is there anything more you would like to add?

Would you be willing to meet with me a second time in case I don't understand something that was said or I have a question about what you meant? Yes_____No_____

I would also like to send you a copy of the transcript so you have a chance to see if I have captured the meaning behind your words correctly. Would you like the transcript mailed to you on paper or is email okay? Mail_____Email_____

Thank you for your time.

APPENDIX D: SECOND INTERVIEW PROTOCOL

I want to thank you for taking the time to meet me again today. This interview is a follow-up to our interview together last time, and I have some questions I would like to ask you to clarify some of your previous responses and to probe deeper into other areas. This interview should take no more than half an hour. I will be recording this session on my laptop in order to transcribe our conversation later for analysis. All responses will be confidential. Once again, participation is voluntary, and you may stop this interview at any time if you wish. You may skip any questions you do not wish to answer.

Are there any questions about what I have just explained? Are you willing to participate in this interview?

_____ _____

Interviewee signature Date

Second Interview Protocol:

1. If you hear that staff members are feeling overwhelmed with a change in what or how they use technology, to what extent do you provide more time for staff to acclimate to the changes?
2. Tell me how you encourage staff to tap into the strengths they might have in making difficult changes in how they use technology?
3. How do you decide on what your staff needs to be focusing on in order to relieve the stress they are experiencing when confronted with a change in the technology they use?
4. Tell me the extent to which you enlist informal leaders from among the staff to help you contain the stress of the changing what or how technology is used?
5. How do you choose the decision-making process that you will use when making changes in technology with your staff?
6. Tell me about how you mobilize all of the stakeholders in your district in moving towards a change in how technology is used?

APPENDIX E: DOCUMENT COLLECTION

Documents to be collected from case study sites:

Tech committee/group meeting minutes/agendas

Web site – evidence of technology items/staff

Vision statements – school and/or district – maybe on web page

Administrative team meeting agendas – evidence of technology discussion

Board meeting agenda/minutes – evidence of technology discussion

Newsletters home to parents from schools – evidence of technology items

Strategic plan – if there is one, evidence of technology items

Budget – evidence of technology items/staff in budget

Analysis of documents will use a process of skimming for an initial read of the document, a second and more in-depth examination of the document, and interpretation, where coding is applied as part of the larger data analysis for themes (Bowen, 2009).

BIOGRAPHY OF THE AUTHOR

David L. Fournier was born in Lewiston, Maine, and raised in Jay, Maine. He graduated from Jay High School (Jay, ME) in 1983, then earned a Bachelor of Arts in Computer Science with a concentration in Mathematics (1987) and a Master of Education in Educational Leadership (2008) at the University of Maine (Orono, ME).

Professionally, David has served as an officer in the United States Air Force; an office manager in Waterville, Maine; a Senior Trainer/Software Support Representative for a software company in Bangor, Maine; and a Director of Technology for AOS #94 in Dexter, Maine, and RSU #71 in Belfast, Maine. Fournier has also been a lighting and sound technician in several community theaters.

David is a candidate for the Doctor of Education degree in Educational Leadership from The University of Maine in May 2019.